FOOD INDUSTRIES

manufacturing and processing

McGRAW-HILL PUBLISHING COMPANY, INC. - JAMES H. McGRAW, *President* - EDWARD J. MEHREN, *Vice-President* - H. C. PARMELEE, *Editor*

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Adventure—1928 Model

COMMANDER BYRD has sailed into the Antarctic on a two-year adventure in exploration—the modern counterpart of Columbus or Vasco da Gama. That his equipment includes airplanes instead of caravels and radio with which to keep in touch with the world is merely an expression of progress and detracts not one whit from the glamour of his quest. His is the spirit of research and investigation that makes curious minds wonder about the unknown.

- - - But one does not have to go to the Antarctic for exploration. The spirit of American business and industry today is one of curiosity about the unknown coupled with an intense desire to solve its riddles. Adventure lies just 'round the corner if one is willing to make the turn. It lies in scientific research if one has the vision to initiate and the imagination to apply. It lies in the exchange of ideas with a friendly and broadminded competitor, or even with a manufacturer whose problems seem to bear no relation to our own.

- - - Food manufacture is no exception. It stands today at the portals of an era of research and development leading to new achievements in scientific and economical production. It is face to face with a period of interchange of thought and opinion that will profit every unit of the industry. Modern developments are pressing for trial and adoption. The spirit of adventure is finding expression.

- - - It is in recognition of this sign of the times that the editors of *Food Industries* offer a medium for exchanging ideas and adapting them to new uses. Knowing full well that every executive, manager, superintendent or technologist cannot visit his colleagues in other plants, *Food Industries* proposes to cater to their adventurous spirit. It is dedicated to a policy of discovering and presenting ideas which, with a little constructive imagination, can be applied to wider uses.

- - - There is a common bond of interest among food manufacturers, despite the variety and diversity of their products. It lies in their common use of many of the same processes based on the same fundamental principles. This, in turn, means that each can learn from the others if he has a medium of information through which he can keep abreast of developments. *Food Industries* offers that medium in a spirit of service to every food manufacturer who has enough curiosity to want to venture outside his plant and learn what others are doing.

The Ideal Behind the Safety Program

IF ONE correctly interprets some of the addresses at the recent meeting of the National Safety Council in New York, there seems to be a larger idea back of the term safety than is commonly understood; there seems to exist a more fundamental ideal, of which safety, with all that the term implies, is but a lesser manifestation.

In particular the address of W. M. Oler of the Knickerbocker Ice Company bears out this thought, for he believes that accident prevention is but one method of achieving the larger ideal—contentment. The cause of accidents must first be sought in the mind and the cure must likewise be found there. Listeners to his address could not fail to be convinced that safety work directed by one inspired by the idealism which he expressed—the bringing of contentment to others—is bound to be the most effective in the long run, for life can bring us no greater reward than peace of mind, and he who has this vision is a worthy safety director indeed.

The veritably staggering annual losses from industrial accidents—for indemnities never equal wages lost—the prevention of collisions on the street; the sparing of the life of a thoughtless child; the prevention of the shattered home or ruin of the family fortune; these should all give pause to many who are embarking for the first time on really serious safety programs.

One who has grown gray in service and knows all too well the petty irritations caused by some officious safety committees, the smallness of some safety inspectors who are actuated more by the feeling of necessity of making a showing on a voluminous report than by the kindliness of the human heart, urges that the greatest care be taken to make certain that the head of safety work in any institution be not only a capable man but one to whom more than the average breadth of vision is given.

Have the Go-Getters Gone Too Far?

A FEW months ago there was published by the Bureau of Foreign and Domestic Commerce a survey of the distribution of candy in the United States, by Rupert L. Purdon assisted by twelve leading candy men including Walter C. Hughes, the able secretary of their national organization. From more than one point of view this is a notable publication. Not only does it represent the first attempt of a governmental body to analyze the problem of distribution of a specific commodity but also it frankly states certain matters that should be of real service to the makers of many food products other than candy.

For example, it stresses the fact that there is much "gunning for business" in states more or less distant from the spot of manufacture. It graphically demonstrates that, in 1925-6, in only nine of our 49 political divisions were local manufacturers selling as much candy as were outsiders in the very states where the formers' plants are located. Of these nine, California led the list, followed by Illinois, Massachusetts, Indiana and Washington. The poorest showing was made by manufacturers in Florida, Connecticut, Ohio and Missouri.

Editorially this matter is commented upon to the effect that while it is, of course, impossible that *all* candy produced in any one state can be sold within its borders, and that nationally advertised specialties will maintain their great sales margins will continue to be na[illegible] distribu[illegible], it is "unsound to accept the conclusi[illegible] all types of candy are able, after absorbing high transportation and sales costs to distant markets, to compete with exactly similar goods in their home market and return profit to the manufacturer."

Tracing Spoilage to Its Source

THE immense losses in the past to canners of vegetables, such as peas and corn, have been traced in part to the presence of thermophilic bacteria. It is only sixteen years since Barlow first isolated them from canned corn in Illinois. At that time nobody could do more than guess where this strange form of life originated or how it found its way into the canning plant.

Many of the thermophilic bacteria can grow only at temperatures far above those at which all other forms of life will perish, and in addition to this their spores possess a resistance to death by heat that is remarkable. Some of their spores can remain alive after immersion in boiling water for sixteen hours. Their extreme resistance to heat has made it necessary for manufacturers of foods sterilized by heat to resort to extremes of temperature that in some cases may actually darken their product by scorching.

Recently, however, several bacteriologists have found that the thermophiles seem to be associated with sugar and much study is now being directed toward this raw material of the canning industry. The paper by Dr. L. H. James, appearing in this issue, is an important contribution to the larger question of their origin.

If it could be clearly proved that thermophilic bacteria come from no other source than refined sugar it is possible that a new technology of canning may develop in which the syrup will be sterilized separately under conditions rigorous enough to kill all thermophiles before they are mixed with the foods. This would permit the final conditions of sterilization to be less severe and would avoid occasional overcooking. It should be emphasized, however, that this is a hypothesis and that technologists are not yet in entire agreement as to the origin of the several types of thermophilic bacteria.

Let Industries Learn From the Humble Cow

IN 1916, eighty billion pounds of milk furnished dairy products equivalent to a per capita consumption of 804 pounds. There were required 225 cows per thousand consumers of milk products. Ten years later, there had been not only a fifty per cent increase in milk production, but also a thirty per cent increase in consumption per capita of dairy products. And during this decade the number of cows per thousand milk consumers was lowered by fifteen per cent. The estimated advantage to the dairy industry of this improved economic relation is figured by authorities in terms of hundreds of millions of dollars per year.

The dairy industry has discovered that its unit-operation equipment—the cow—must be an efficient machine to transform hay, grain and grass into milk of high butter-fat content. We have not seen her efficiency expressed in terms of pound-gallons per cow-day or other equivalent term; but, regardless of the unit of expression, there has come a clear understanding of sound quantity relations.

Possibly it will be well for some of the processing industries, whose troubles are not greatly different from those formerly prevailing in all branches of agricultural business, to examine carefully the reasoning which has led the dairying business out of its condition of financial distress to its present position as one of the more prosperous groups in the agricultural community. Instead of better-bred cows, we suggest better designed processing equipment as one equivalent that is worthy of thought. And in the problems of marketing there are certainly some of our industries that could learn much from the co-operative associational work of the dairy industry.

Research Needed in the Development of Vitamin D

THE recent discovery that ergosterol is highly activatable by ultraviolet light is a most important contribution to nutritional science. Under this treatment the potency of activated ergosterol becomes from 100,000 to 200,000 times greater than that of cod liver oil. There seems to be present in most foods ergosterol or some other sterol, but some foods possess these activatable compounds in a greater degree than others.

The food manufacturer should have research work done immediately to find out what irradiation will do to his products as far as vitamin D, the antirachitic vitamin, is concerned. He will then be in a position to determine what his course shall be and whether commercial irradiation is feasible. Thus will he avoid any unpleasant surprises, such as reading a competitor's advertisment informing him for the first time that the food he is manufacturing may be low in vitamin D but that the competitor has remedied the deficiency. Progress demands the prompt utilization of new knowledge to keep at the head of the procession.

Quality Grades Tending Toward Standardization

IN THE canning industry the method of defining the quality known as *fancy, extra-standard, standard* or *sub-standard,* has long been a moot question around which two schools of thought have developed. One claims that the best of the season's pack, for example, shall be called *fancy,* and the other, taking exception to that point of view, maintains that the term *fancy* should apply only to goods conforming to a fixed set of conditions.

Thus the first school adheres to a flexible system under which the designated quality of a given can of food might be dependent upon the abundance of the season. Or, if the best of the season's production were only of third quality on an absolute system, a lot of second quality goods might be called *fancy.* The second school, which heretofore has been an academic minority, demands an absolute system of grading, frankly admitting that in extremely poor seasons there might be no foods produced of strictly *fancy* quality.

The scarcity or abundance of goods, therefore, exerts a marked influence on the designated grade under a flexible system, and in years of marked shortage there is little difficulty in designating as *fancy* what might, perhaps, be classified as a lower grade in years of plenty.

Between manufacturer and jobber there has been no important objection to the flexibility of such a system. It proves to be unsound only when the ultimate consumer, in total ignorance of the underlying theory, is disappointed by the quality of goods purchased under a label that previously had covered a better quality.

A new force is now becoming apparent that supports the inflexible or absolute system and that will tend towards the gradual elimination of the flexible system of grading. This force is the U. S. Warehouse Act. Under its provisions receipts may be issued by licensed warehouses covering canned foods graded by licensed inspectors, which may be accepted by banks as collateral for loans. The grading is based upon inflexible government grades. A recent special notice by Mr. Yohe, in charge of the administration of this act, contains a statement, elicited by the then impending crop shortage, to the effect that the size of the raw crop is not to be a factor in determining the grade of the canned product.

A strict enforcement of this principle without question will inevitably, if perchance slowly, react to the ultimate good of the whole industry.

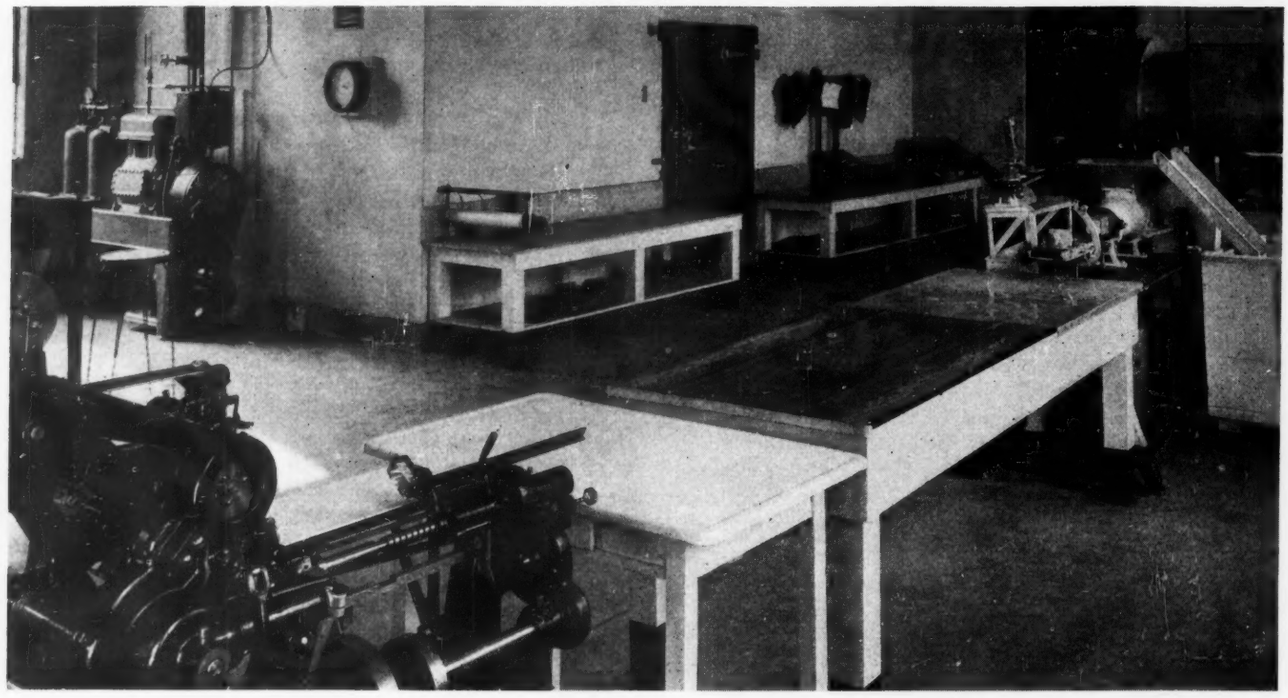
Are There Industrial Uses for Sugar?

IS SUGAR only a sweetener or has it a wider industrial significance than its use as a food? Some of its manufacturers can hardly be aware of its true position in the chemical world. Sugar, a polyatomic alcohol, is the only organic chemical known to modern man that is manufactured chemically pure on a tonnage basis. It is sold at a price that is not comparable with that of other C.P. organic chemicals.

Acetic acid, vanillin, cinnamic aldehyde, sodium chloride, carbon dioxide, malic acid, di-sodium phosphate and mono-sodium carbonate are but a few of the long list of chemicals used in varying degrees of purity in food manufacture, none of which can compare with sugar in purity at a reasonable price. It is quite surprising that no use for this pure chemical exists today other than to eat it. To be sure it is used in a small way as a preservative, but even there its ultimate destiny is the alimentary tract.

Chemistry has spent many years in perfecting this product that at present has but one use—food—and has failed to add any new outlet. It is hardly possible to overestimate either the magnitude of this unsolved problem or the probable reward for its solution.

Very recently Rudolf Spreckels, president of the Federal Sugar Refining Company, brought the whole question before the Sugar Institute with the result that a research committee has been appointed to study possible developments in this line. While no further announcements have been made it is not improper to predict that results of considerable value to the industry should result from a vigorously prosecuted research.



A General Refrigeration Company unit in daily use in a yeast factory

REFRIGERATION —*Everybody's Friend*

By E. M. PENNINGTON
Consultant on Refrigeration, New York

AMERICANS, as a nation, "Want what they want when they want it!" Particularly do Americans want seasonal foods the year around, and both staples and luxuries must be available when desired though they be brought from the ends of the earth. So refrigerated ships pour foreign-grown foods into American ports, and refrigerated cars, from the Pacific to the Atlantic and from the Rio Grande to the St. Lawrence, distribute the products of the soil to American cities, towns and countryside. The luxuries of the banquets of Lucullus are more than matched today on the tables of the working men of America. That it is so we must thank refrigeration.

There is a fascinating story woven around the refrigerated foods which come to us from overseas, but for today let us consider some of the accomplishments of the application of refrigeration to products grown and marketed in the United States. Fish—fruit—flesh—fowl—where shall we begin?—for most of us owe all of them to methods of food handling developed within the last half century.

Time was when the agricultural population was so much larger than the urban population that the distribution of food to the non-producers in cities was a minor problem. Now our agricultural population is steadily decreasing. In 1920 we had about thirty-one million people on the land, while in 1927 we had but twenty-eight million. But let no one think that such a decrease in farmers spells also a decrease in output! American production efficiency is busily seeing what land plus science plus machinery can do, with the present result of a five per cent increase in crop production and a fifteen per cent increase in animal products during the very years which sent the three million land workers into the towns and cities. For the present, at least, we need have no fears for the food supply of the urban population provided we can take to them in sound condition and high quality the fruits of the soil.

Of the various factors which enter into successful distribution of perishable foods none is more essential than refrigeration in the packing house, the precooling plant, refrigerated transport and the cold storage warehouse; not to mention the retailers' and the householders' ice boxes.

The great meat packing industry of today, with its multitudinous ramifications into byproducts of many uses, began to be an industry when the first fresh carcass was cooled by dry, cold air. But, forward-looking as

were those few butchers of Chicago, they never dreamed that their pioneering was to change the dietary of whole nations. That it would, ultimately, give us a means of abolishing rickets and scurvy and pellagra—that last dread nutritional disease with its stronghold in the rural South where the refrigeration of foods is but now beginning to penetrate and where its benefits are so sorely needed.

Neither did W. W. Chandler, destined to become the foremost man in the first refrigerator car line of the United States, dream of the great fleet of more than two hundred thousand refrigerator cars which would one day develop from the sawdust insulated box on wheels in which, in 1857, he shipped dressed meat from Chicago to Pittsburgh amid the skepticism, if not the jeers, of his fellow railroaders. Neither did Parker Earle, pioneer in fruit distribution foresee that his experimental shipments in makeshift refrigerator cars of strawberries, peaches and the like, were paving the way for a great strawberry industry in Mississippi and Arkansas and Florida and peaches from California and Georgia and Colorado, so treading on each other's heels in city markets that the usual purchaser quite loses sight of the "seasonal" character of such crops.

Many years after such pioneers as Swift, Morris, Chandler, and Earle, when other men had extended orchard acreage into far regions and beef-packing plants were being definitely pushed into the great Western prairie country, the hauls to market were so lengthened that spoilage in transit became too serious a matter for commercial neglect. Then science was called to aid growers and shippers, chiefly through the various bureaus of the United States Department of Agriculture, which sent its young college men who had specialized in chemistry, bacteriology, horticulture, dairying, and biology to study the problems at each step in the journey from the producer to the consumer.

Artificial Refrigeration Becomes Scientific

Very promptly they found that low temperatures were imperative if spoilage of perishable foods was to be prevented, and they went much further in the application of them than had the men of the industries. The horticulturist knew that the maximum keeping ability compatible with dessert eating quality was reached by the fruit at a certain stage of tree or field ripening. At that stage, prompt and sufficient refrigeration might accomplish its perfect work. The growers had tried to forestall decay by picking fruit very green—thereby losing flavor and lusciousness at the market. The scientists said. "Harvest at the proper stages, cool as soon as harvested, generally to below 40 deg. F. Ship in efficient refrigerator cars. If the goods do not go immediately into consumption at the market, hold them at proper temperatures in cold storage until they do."

Of course, having the insatiable curiosity of all true scientists, these men found no insect too insignificant, no soil too familiar, no plant or animal food too customary to forego the examination of it as related to sound condition and high quality of the product at the market. For, like other possible panaceas for widespread evils, refrigeration was soon called upon to accomplish the impossible and blamed for ills in which it had no part.

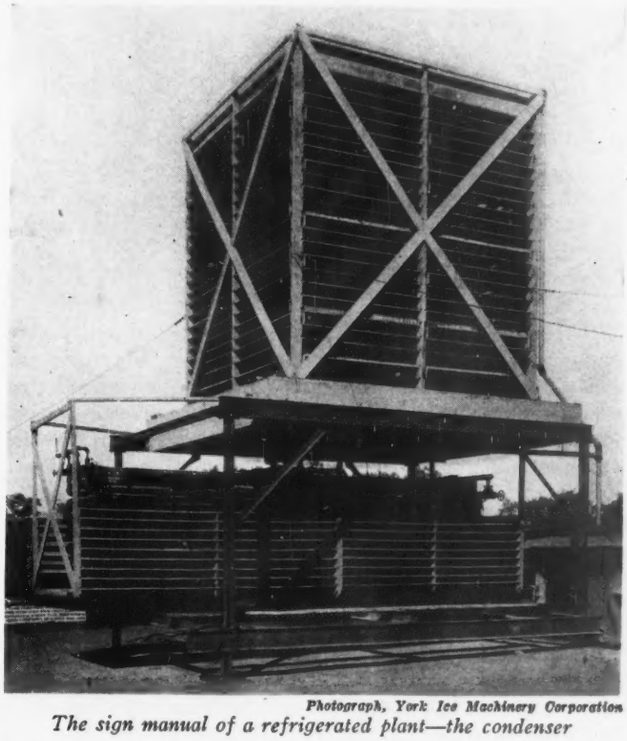
For example, the orange industry of California was almost devastated twenty-five years ago by the rotting of the fruit due to blue mold infestation which developed while en route across the continent. Refrigeration was palliative but not remedial. Studies in the groves showed that the fruit must be carefully handled to avoid scratches and skin punctures, into which the blue mold entered and from which it penetrated the fruit itself. *Blue mold could not attack the perfect skin surface.* A campaign of instructions in careful handling in grove and packing house so lessened spoilage in transit that for years the citrus industry in California was the prize example of the result of such co-operation between science, commerce, and refrigeration.

On the other hand, nothing but refrigeration, and plenty of it, in unbroken sequence will prevent the spoilage of eggs, peaches, strawberries and a host of other commodities when subjected to the atmospheric temperatures common to marketing.

Early Refrigeration of Fruits

With so few exceptions that they merely prove the rule, perishable foods should be chilled as quickly as possible after gathering or slaughter. Thus, the need for precooling facilities at the source of production. Unfortunately the individual producer seldom has a sufficient output to warrant the construction and operation of a precooling plant. If he is in a territory which specializes in certain products he may have access to a co-operative precooling and packing plant; or he may sell outright to a shipper who does the precooling before loading into cars.

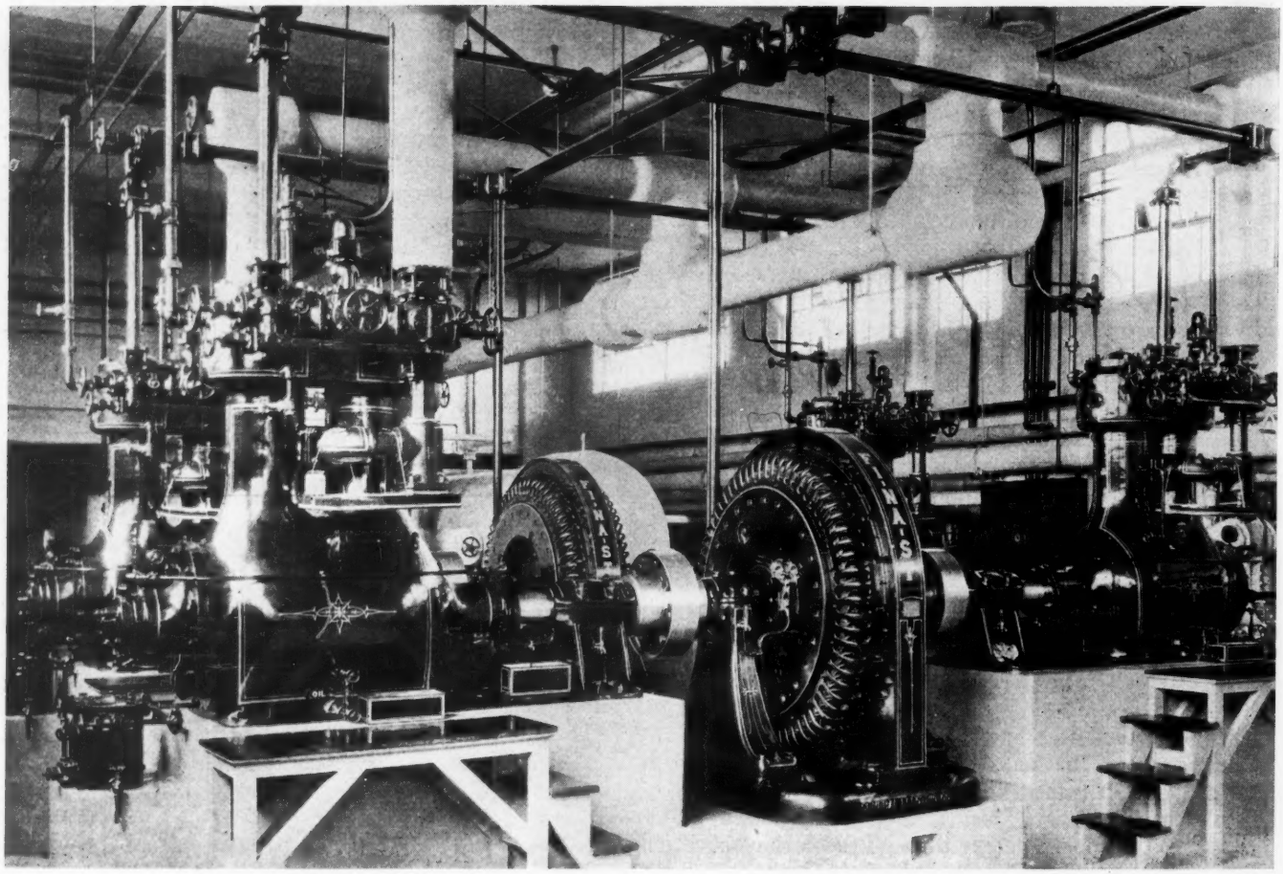
The concentrated production of citrus fruits in southern



Photograph, York Ice Machinery Corporation

The sign manual of a refrigerated plant—the condenser

California and Florida, of apples and pears in certain sections of Oregon and Washington, of celery around Sanford, Florida, and of peaches in Georgia, are examples of heavy investments in land and equipment around which must be thrown every financial safeguard. Hence we find such localities provided with precooling facilities generally in connection with a grading and packing plant. They are foci for not only better quality products at the market, but frequently are headquarters for research into better production and handling methods. Where pro-



Where artificial refrigeration is produced. A typical installation, this view showing a York outfit in the Somerville, Mass., plant of the First National Stores

duction is very heavy, both precooling and storage may be provided. Such precooled goods are generally loaded into precooled refrigerator cars and losses from decay in transit are reduced to a minimum, though the haul be across the continent.

The grower of small fruits and berries, on the other hand, must ordinarily depend upon the refrigerator car to chill while it travels. His crops are so perishable that unless precooling is very rapidly accomplished he will lose more by the delay and the extra handling than by shipping quickly in a *good* refrigerator car. In these days that term applies ordinarily to a car of the "United States Standard Type."

Development of the Refrigerator Car

No matter how efficient the other links in the refrigerated chain may be, for the great mass of transported perishables the refrigerator car is the limiting factor. If it has sufficient insulation and adequate cold air circulation it makes but a small break between packing plant and cold storage warehouse or the jobber's cooler. On the other hand the poor car may invalidate the work of the precooler.

Twenty-five years ago, when the routine practices of today were merely isolated scientific experiments, it was found that so-called refrigerator cars permitted precooled fruit to return to rot producing temperatures twenty-four hours after loading, in spite of plentifully supplied ice bunkers.

Obviously, it was useless to invest money in precooling plants until the refrigerator cars were good enough to carry on the precooler's work. Therefore, the energies of the investigators from the United States Department of Agriculture and the influence of the producers turned to the railroads and the refrigerator car companies.

The government men were young and unknown. The railroad men were veterans on their jobs and well satisfied with earnings as they were. It was the proverbial head against the proverbial stone wall! But no group of business men can unendingly refuse to consider fact upon fact upon fact—consistent, practical and affecting materially the welfare of the customer. It took years of fact gathering, hundreds of experimental shipments and endless conferences with railway heads to achieve a constructive understanding of the great issues at stake—namely, sound food for the people, production intensified and territorially widened and harmony between shipper and the railways.

When such an understanding was reached, producers, shippers, receivers and the railways vied with each other in co-operating with the men of the government—who were quite a bit older then, and with reputations in their own specialties which went even beyond the confines of the United States—to incorporate in their refrigerator cars those essentials of construction required for efficient performance.

When men and materials were at a premium during the Great War and we had to furnish food for the Allies and ourselves, the prevention of food spoilage assumed a new significance. Under such a stimulus a joint committee of men of the railways and of the U. S. Department of Agriculture agreed upon certain essential features of the refrigerator car, notably (1) the amount and distribution of insulation, (2) the basket form of

ice bunker, (3) the insulated baffle (or bulkhead) and (4) a floor rack, four inches in the clear above the car floor, built with lengthwise stringers and cross slats. On all these parts of the refrigerator car there existed a great mass of scientific data accumulated through years of experimental observations. From them the committee drafted specifications on which the railways agreed and which to this day, with but minor differences, are being built into the refrigerator cars of all the great companies.

Returning now to the berry grower without a precooling plant, we find that he loads directly into the precooled car, as quickly as possible after the berries are crated. If the car is of the "U. S. Standard Type" he can add from one to three per cent of salt to the ice in the bunkers, which gives a temperature several degrees below that of ice alone. The basket-bunker-insulated-bulkhead-floor-rack combination insures a relatively rapid and complete circulation of cold air, thereby removing more quickly the field heat from the berries. Many a grower has found this practice a godsend and many a consumer has said, "What fine berries! Every one sound.

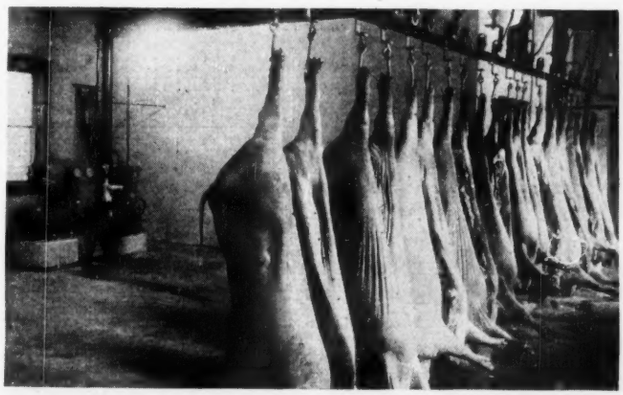
In Florida, berries right from the field have been plunged into iced water, with beneficial results. Celery, also, has been so cooled, thereby reaching the distant market in much better condition. Citrus fruit dips—usually containing some boron compound as a fungicide—are beginning to be used cold instead of hot, thus removing some of the grove heat. Whether we use cold, dry air, or melting crushed ice or iced water the fundamental of quick cooling to prevent decay holds good.

Refrigeration of Animal Products

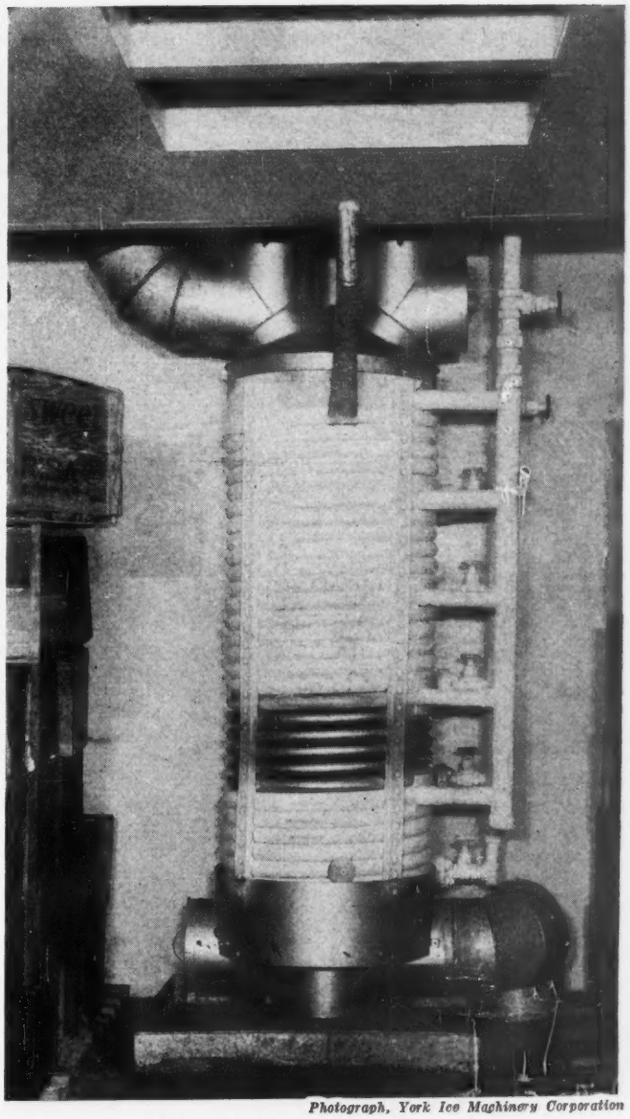
Animal slaughter houses without mechanical refrigeration are unthinkable, but only in relatively recent years have the poultry packers as a group sent to market chickens which were chilled in cold air. Fortunately, "dry packing" as the method was called, became an almost universal practice before the great increase in the production of poultry which accompanied the war arrived. The removal of the animal heat from the slaughtered, plucked fowl is, in principle, strictly comparable to the removal of atmospheric heat from the fruit of vegetable.

Eggs, too, are precooled, and one of the most extensive and continuous of all the educational campaigns for the betterment of foods has been waged upon producer, shipper, and jobber to acquaint him with the rapid loss in quality and in money value of eggs if they are not kept cool from production to consumption.

Thus have fruit, flesh and fowl come under the saving grace of refrigeration between producer and consumer, but what about fish?



York refrigeration in the meat packing plant of Ralph & Paul Adams, Bridgeville, Del.



Photograph, York Ice Machinery Corporation

A characteristic set of cooling coils

The fishing industry has long suffered from the fact that fish, in commerce, carried with them the slop of melting ice and an objectionable odor, but the fallacious theory that the cold water from melting ice was necessary to their preservation acted as an effective ball and chain on the proper development of our fisheries. Only in very recent years has the fishing industry begun to throw off the shackles of wet packing. It is now turning to quick freezing and with most encouraging results.

Fishing fleets near the shore bring their catch to large freezers which wash, size and grade before freezing. Trawlers or larger vessels which may be out of their ports for two or three weeks can freeze on board by means of one or another of the so-called "brine freezing" methods. To do this the fresh fish are immersed in a strong salt solution held at a very low temperature. Such a solution, being a much better conductor of heat than is air, absorbs the heat in the flesh of the fish very rapidly. Small fish may be frozen hard in half an hour, instead of twelve or more hours as is required by the cold air method. The salt solution does not penetrate the flesh to any extent at such low temperatures.

Even more recent and, in many ways more promising, is the preparation of fish "fillets" and their quick freezing in the packages which go to the consumer. Cartons

Photograph, General Refrigeration Company

Refrigeration's latest triumph, aboard the halibut fishing boat "Attu"

of attractive appearance solidly filled with slices of boneless fish, one pound or more in weight, are dispensed like cartons of butter, and are just as clean in the household refrigerator. From larger packages, sometimes in round shallow tin containers like candy or cake boxes, the retailer dispenses the quantity desired. The astonishing thing is the just-out-of-the-water flavor of the fish and the lack of fishy odor.

Strange to say the odor which we associate with fish is mostly in the mucinous material which covers them and collects especially under the scales where it harbors bacteria galore. Therefore, the immediate scaling and skinning of the fish under the extremely sanitary conditions prevailing in the plants which are putting out high-grade fillets is an aid to preservation. Quick freezing does the rest.

Here and there one still finds people of at least average intelligence who insist that they do not purchase "cold storage" food. The people who can "always tell cold storage food by the taste" still discourse positively upon that subject. That they may be quite honest makes them no less erroneous.

That refrigeration shall preserve seasonal crops from one season of production to the next is a logical sequence to its use as a means of preparing foods for quick marketing. That the combination has not only provided us with a marvelously varied assortment of fresh foods throughout the year but has given us high quality and sound condition as well, the public is gradually learning. That those who revel most heartily in the delicacies of the table provided by the aid of cold storage are often the most violent denouncers of it would be humorous were it not so detrimental to the morals of our retail provision merchants.

Many classes in home economics are annually taken through cold storage warehouses. What the students see is a revelation. These women commonly become teachers or housewives. In either capacity they help to break down unwarranted prejudice and build up an appreciation of the last, and in many ways the most marvelous, link in the refrigerated chain which has revolutionized the dietary of a nation in less than a half century.

Alaska 1928 Salmon Pack Indicates Large Increase

A TENTATIVE estimate of the Alaska salmon pack for the 1928 season to August 31 has been made by the federal Bureau of Fisheries' Seattle office in cooperation with the Association of Pacific Fisheries. The total to that date is 5,582,700 cases, as compared with 3,397,040 cases in 1927 to September 1 and 3,572,128 cases for the entire season of 1927. Thus, the pack through August, 1928, shows an increase of 56 per cent over the entire pack for the previous season and probably will be augmented somewhat by the fall pack, although no great amount of fall fishing is anticipated.

Inasmuch as there has been marked fluctuation in the output of canned salmon in Alaska in recent years (the record pack of 1926 was followed by a subnormal season in 1927), the present condition of the fishery may be indicated best, perhaps, by comparison with the average for the 5-year period from 1923 to 1927, inclusive, details of which are included in the following table:

	Approximate pack to Aug. 31, 1928	Entire pack in 1927	Average pack for 5-year period, 1923–1927
Species:			
Cohoes	189,500	253,044	192,858
Chums	865,000	507,723	808,591
Pinks	2,627,200	1,420,775	2,383,826
Kings	56,000	70,391	48,967
Reds	1,845,000	1,320,195	1,568,870
Total	5,582,700	3,572,128	5,003,112
Districts:			
Southeast Alaska	2,678,000	1,052,193	2,541,514
Central Alaska	1,445,000	1,571,103	1,423,786
Western Alaska	1,459,700	948,832	1,037,812
Total	5,582,700	3,572,128	5,003,112

For all Alaska the indicated increase over the 5-year average is 11.58 per cent; by districts, the increase is 5.37 per cent in southeastern Alaska, 1.49 per cent in central, and 40.65 per cent in western Alaska; chums increased approximately 7 per cent, pinks 10 per cent, kings 14 per cent, and reds almost 18 per cent, while cohoes decreased about 2 per cent. Although the season's pack of cohoes is below the average that standing may well be altered by the results of the fall fishing, in which ordinarily relatively many cohoes are taken.

Technical Control of

FLOUR MILLING

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IN MODERN milling it is the ideal of the miller to make a flour that is absolutely uniform from month to month and year in and year out. Such flour can be produced successfully only by milling concerns of relatively large size whose wheat supply enables them to maintain the quality of their flour practically unchanged from year to year. The desire of the miller to produce an article of the best possible quality has encouraged engineers to perfect many devices for improvement in manufacture. The past seventy-five years have seen the development of milling efficiency to so fine a point as to preclude the probability of further mechanically derived improvement in the quality of the product.

Mill owners became aware of this some years ago and the more progressive of them in their search for commercial advantage turned to the science of chemistry. Here is presented the spectacle of an industry that, having exhausted the ingenuity of one class of technical men to improve the product, turns to another professional group. The cereal chemist has met the situation in very creditable manner. By organization and discussion he has made great strides toward uniformity and accuracy in laboratory analysis and interpretation of results. The American Association of Cereal Chemists was organized for the specific purpose of stimulating research and standardizing methods of analysis. Under its leadership very satisfactory progress has been made.

The functions of a flour mill chemist are primarily to assist, in every way possible, in the manufacture of products of uniform grade and quality at the lowest possible cost, and secondarily to assist in the development and maintenance of an adequate market for these products.

TECHNICAL CONTROL OF FLOUR MILLING

In order to manufacture products of uniform grade and quality, efficient control must be maintained in the selection of the raw materials, and in the process of milling. Outside the trade, "wheat is wheat." Even the farmer treated it as such in the past but today, because of the more intelligent demands of the miller, he is exercising more care in the selection of seed. There are but few who realize and appreciate the problems of the flour chemist and the flour miller. There are more than two hundred distinct varieties of wheat grown in the United States. Wheat is produced commercially in all of the forty-eight states of the Union, and under a wide range of environmental conditions. Some states are very fortunate in that they have but few varieties of wheat with which to deal. Others less fortunate must work with dozens of different varieties.

From a chemical standpoint flour is a very complex compound and a great deal remains to be learned about it. It will not be possible, in this article, to go into the chemistry of flour. Those proteins of the wheat kernel which form gluten when they come in contact with water are the principal components of the wheat kernel that govern the quality of the flour to be manufactured from it. The fact that there is a great variation in the quality of the gluten, even in the same variety of wheat, emphasizes the magnitude of the problems confronting the chemist and the miller.

A. Evaluation of Raw Material.—Each season the flour mill chemist must make a careful and thorough evaluation of the raw material. In establishing standards for the wheat blends for the different grades of flour, a careful survey and study must be made of the quantity and quality of the wheat that is available in the territory tributary to his mill; this with a view to selecting a blend of wheats that can be maintained throughout the season and thus assure the baker a uniform flour.

In order to obtain this information he must actually mill the wheat. In a flour mill laboratory there is, ordinarily, an experimental mill. The chemist puts a sample of the wheat he is investigating through the same processes in this small mill that it goes through in the large mill. With his experimental mill he can (a) ascertain the nature of the wheat, (b) foretell its utility in terms of yield and flour quality as to color and analytical data, and (c) provide flour from which baking characteristics may be ascertained.

In establishing standard blends for the various grades of flour the chemist must consider the following factors:

1. The Requirements of the Trade. More short patent flour is being used today than ever before in the history of the baking industry. A short patent flour makes a better bread. In order to produce a short patent flour of the proper strength and quality the flour mill chemist must have a wheat blend with the proper quantity and quality of gluten.

2. Yield. The physical qualities of the wheat blend must be such as to obtain a maximum yield. From a milling standpoint a good plump wheat of the proper weight per bushel will give the best yield.

3. Cost. The cost of the blend must be kept at a minimum. Owing to the great importance that is attached to the quality of the flour in the manufacture of bread, wheat that is to be used in manufacturing flour for the bakers is sold on a protein basis. During last season a premium of one cent was paid for each tenth of a cent of protein in choice milling wheat. It can be readily seen that, if the blend is one-tenth per cent too high and four and a half bushel of wheat are used in making one barrel of flour, there would be a loss of four and a half cents per barrel.

B. Purchasing of Raw Material.—The flour mill chemist must assist in scheduling the milling program far enough in advance to give the grain department ample time in which to provide the necessary wheat. This

Photograph, Ewing Galloway

An integral part of all large flour mills is the well equipped laboratory where all technical matters are scientifically determined

Photograph, Ewing Galloway

Experimental baking department of the Russell-Miller Milling Company where practical tests supplement the work of the chemist

makes it possible to maintain minimum stocks at the mill and thus cut down the investment in raw materials.

C. Classification of Wheat.—When the wheat reaches the mill it must be classified, not only according to its protein content, but as to the point of origin of the wheat and its quality. The moisture content of the wheat is also important. Some mills have provided facilities for tempering, by the addition of water, all wheat to a standard moisture content and thus facilitating the proper conditioning, with a view to obtaining maximum quality and yield. The wheat is usually binned on the basis of a representative sample obtained at the time the car is unloaded at the mill.

D. Blending.—In making his blends for the various grades of flour the chemist must know the quality of the gluten of the various wheats that compose the blend. He must also provide the amount of his blend necessary for a particular run, no more and no less.

E. Tempering and Conditioning.—The objects of tempering are, first, to prepare the wheat in optimum condition for grinding and, second, to cause the chemical and biological changes in the grain that will improve the strength and quality of the flour. The terms tempering and conditioning are generally used interchangeably and define the process of toughening the bran and mellowing the flour part of the wheat berry.

The wheat is tempered by dampening it with water and letting it stand for some time, the moisture being absorbed by the grain; by passing the wheat through a cloud of steam at low pressure; by heating the wheat, thus drawing the natural moisture of the berry from the interior to the outer endosperm layers and to the bran; by mixing damp wheat with dry wheat and letting them lie in a bin for a certain length of time, the dry absorbing moisture from the damp wheat, which loses of its moisture a part equal to that absorbed by the dry wheat, so that both are brought to the same state or degree of temper or moisture content.

F. Tests in Process.—In order to insure uniformity of composition various control determinations are made while the flour is being milled.

1. Moisture. Moisture determinations of the wheat are made periodically to see that the proper amount of water has been added in tempering. Moisture determinations are also made of the finished flour to make sure that the moisture content is not excessive.

2. Color. Every hour the flour is slicked, or compared with a standard, for color, dress, and granulation. A well-dressed flour is one that is well sieved, or bolted, so as to give a fine, even, clean flour of good color. The color of patent flour of low extraction (fine patent flour) varies with the type of wheat used. The flour from soft wheat has a very white color, approaching that of corn starch. The flour from hard wheat has a slightly creamy color and for many years this creamy tinge was considered by the bread baking customers a sure indication of superior quality. But at present, flour of equally high grade is bleached in harmless fashion, producing a clear white color that satisfies the current demand.

3. Protein. Protein determinations are made of all wheat blends to see that they are kept uniform. In order to insure uniformity a protein determination is made of the flour at regular intervals.

4. Ash. Frequent ash determinations are made of the flour to learn whether or not the mill machinery is functioning properly. Pure bran is higher in ash than is pure endosperm, a fact that is used in classifying correctly the streams of stock in the milling process as well as for detecting and locating sources of trouble when they occur. The ash test is one of the most valuable tests in mill control and in general estimation of flour quality. However, it must not be used with too much emphasis when the history of the flour is not known, as the ash of different wheats varies to a considerable extent.

5. Baking Test. The baking test is the final and conclusive test that the flour chemist employs to determine the baking strength of the flour. This test supplies a means of determining irregular conditions due to any possible abnormal proportions of the constituents of the flour and as it is simple, quick, and inexpensive, it is used and relied upon. It indicates the strength, tolerance, and stability of a flour. The water absorbing property and the finished loaf give information as to the ability of the flour to produce a loaf of good volume and quality.

G. Grades of Flour.—In making flour the miller endeavors to remove as much as possible of the inner portion of the wheat berry from the bran in the form of granules. The flour resulting from the more highly purified streams is the whitest in color, the best in baking qualities, and the most desirable for almost all purposes. Such flour is called *patent* and as such sells at the highest price of any of the products of milling. All the other streams of flour in the mill, excepting about two per cent of the very poorest grade, go to make another grade of flour called *clear,* a product neither so white nor so even in granulation; nor does it have the good baking qualities of patent flour. It commands a much lower price on the domestic market and considerable amounts of this grade go to foreign markets.

As mentioned previously in this article there is an increasing demand, particularly among the largest bakeries, for the short patent or very best flour that it is possible to manufacture. Such flour will produce a loaf of bread with a finer grain, smoother texture, and better color than will the longer patent flour.

Bakery Service and Sales Promotion

The flour chemist of today is not a cereal chemist only; he is also a trained and experienced bakery production man. He knows the technical problems in both the mill and the bakery. He can go into a bake shop and make standard quality bread under bake shop conditions. It is seldom that the flour chemist is obliged to go into a shop in defense of his product: usually some problem arises that causes trouble in the bake shop and the flour chemist assists the baker in solving this problem.

Recommendations are frequently made as to the most suitable machinery and equipment. Formulas and methods of production are discussed and worked out to help the baker produce a good quality product at the lowest possible cost. Through his technical knowledge of both milling and baking he is able to carry on research work that results in a better product for the baker.

There has been a very noticeable change in recent years in the type of men employed as bakery production managers. In the main they are scientifically trained men who appraise their raw materials in terms of chemical data and solve their shop problems in the light of a definite knowledge of fermentation. They are not inclined to accept generalities or unsupported claims as the basis for considering the merits of their materials. With such well trained men as the flour chemist and the bakery production manager of today there will certainly be further improvement in the methods of production and the quality of bakery goods and a greater knowledge regarding flour—the basic material of the baking industry.

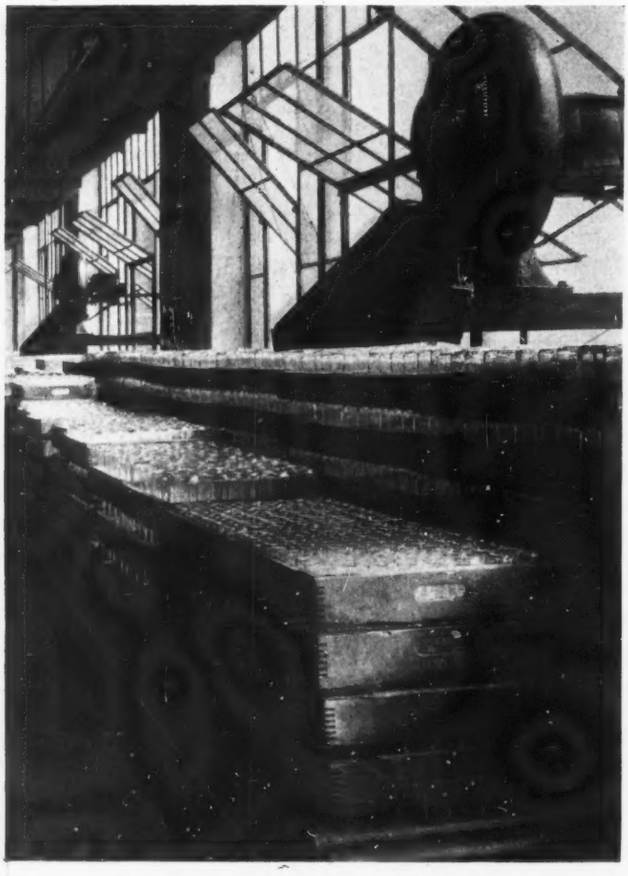
MECHANICAL HANDLING *of Mayonnaise Dressing*

By LAURENCE V. BURTON
Assistant Editor, Food Industries

IN LONG ISLAND CITY is what is probably the largest mayonnaise factory in the world and strangely enough its growth has been achieved in six years. In fact, Richard Hellman has been a mayonnaise manufacturer only since 1912.

To one previously accustomed to small-scale operations in the manufacture of this type of edibles the possibility of unusual labor-saving devices seemed to be rather remote, and the several ingenious arrangements of machinery and conveyors are quite stimulating.

The amount of goods manufactured in July, the peak month, necessitates the handling of a very considerable quantity of supplies with great dispatch, for Hellman manufactures only enough goods to fill the orders for that particular day. There is never any appreciable stock of finished goods on hand, and at night the carry-over is barely enough to fill the first trucks leaving the shipping dock the next morning. Mayonnaise being a product that is semi-perishable necessitates this policy and it also requires that the merchandising of the product be done entirely by trucks from the most important distributing centers.



Sterilized glass is cooled by two blowers

The whole layout is designed to give a rapid turnover within the factory, and since the trade has become accustomed to transactions in this article on a strictly cash basis, it is a business that possesses certain very attractive features from that standpoint.

From one to one and one-half car loads of edible oils and approximately three car loads of glass jars must be handled every day during the height of the season, with other supplies in proportionate amounts. This means that each day all this quantity of supplies must pass into the plant and out again, for as was stated previously, there is no stock of finished goods kept on hand at any time. Therefore, the handling of the glass jars and finished goods constitutes the main problem of operation.

Oil is received in tank cars, drained by gravity through a filter to 10,000-lb. tank scales for weighing in, and again dropped by gravity through another filter to the sub-basement storage tanks where a proper temperature is attained without the use of artificial temperature control. When required on one of the upper floors for manufacture it is pumped by means of a Taber rotary pump to a reservoir on the floor above the manufacturing department and passes through a third filter enroute.

Glass jars packed in the shipping containers received in solid cars, must be unloaded and either stored or else uncased, washed, filled, labelled and repacked. The latter is the normal course of events. From the car the cases of empty jars are placed on a roller conveyor extending into the car and roll by gravity down on to a belt conveyor passing through a storeroom from which they may be deflected, if desired, from the main conveyor to lateral conveyors by the insertion of a curved bar across the belt at a suitable place. Ordinarily, however, the cases continue moving to an elevating conveyor that carries them up two floors to the unpacking room adjacent to the sterilizing room. From the sterilizing room the jars are carried to a filling room just beyond.

An important feature of the unpacking room is an Alvey Manufacturing Company automatic belt conveyor that extends around the room and when a case of jars once gets on to it the case follows a continuous circuit of the room indefinitely until it is removed by hand. The central space inclosed within the rectangular "merry-go-round" is used for storage. At the side nearest the sterilizing room are located the unpackers. The men who do this work pick off the light cases, unpack the jars into trays, and replace the separators into the empty cases. The empty case is placed on a belt conveyor located

above that side of the "merry-go-round" and is carried to the end for stacking on skids to be carried to the take-off end of the labelling machine. The trays of empty jars are placed on a level roller table for temporary storage until that particular size is called for by the filling room. Empty trays, all of the same size, are found on a third belt conveyor located underneath the adjacent side of the "merry-go-round."

By means of this system the unpacker need not move from his station to receive or deliver work and the cases to be unpacked flow past each station in a constant stream, the relative proportions of the several sizes being governed by the rate at which cars are unloaded or storage glass is being drawn upon.

The trays, containing empty jars placed upside down, are shoved on roller conveyors to the sterilizing room for washing, rinsing, sterilizing, draining and subsequent drying. The latter is accomplished by blowers, located at suitable places along a lengthy roller conveyor that delivers the glass to the operators of the filling machines. Cooling in addition to drying is accomplished in this manner for it is quite necessary that the mayonnaise be put into cold jars, otherwise the emulsion would break.

Filling is done by Philadelphia Filling machines, filling four rows of jars at a time. The mayonnaise is fed to the machines through a pipe from the floor above. One operator places jars on the filler and one inspector adjusts the fill. Traveling on a conveyor they go to a Pneumatic Scale Corporation automatic capper, then to a World Automatic Rotary Labeller. After receiving the label they are picked off the table and packed into the cases that have been brought in from the unpacking rooms on skids.

At this point is located a very convenient method of getting the filled cases across an aisle to a belt conveyor leading to the shipping department, and by it is solved a problem that confronts many factory operators in other line of manufacturing, namely, how to keep an aisle open and yet avoid lifting goods across gaps.

The device, called a sliding table, is an extending roller conveyor that can be pushed out across the aisle with as much ease as one would open a drawer of a letter file, and operates in exactly the same manner. As soon as a case is filled it is pushed by the left hand of the packer. The whole conveyor easily slides out till it meets the belt on the opposite side of the aisle and then the case is rolled off by hand on to the belt, tripping a counting machine as it goes. The production of each line is thereby recorded. The extended conveyor rolls back by gravity, for it is built on a slight incline antd when released will return to its original position.

On the belt conveyor are gathered all the different sizes of goods packed and, as each is delivered to the spiral roller conveyor leading to the floor below, another counter is tripped. The count is checked a second time.

Men working at stations on the floor next below tape the boxes if they are destined for delivery by Hellman's trucks, otherwise they are sealed with glue. The different sizes of goods as well as different kinds of products are segregated and piled on skids to await shipping.

Orders are made up on this floor, stencilled, loaded on skids and placed on a small elevator that lowers them to the shipping dock one floor below. No goods can be shipped or leave the plant except that they go out on this elevator. It is an excellent method of insuring that every load is checked by the clerk on the dock and no excuse can be made for confusion or too much to do.

There are seven other plants owned by this company located in strategic places to permit the continuance of their policy to deliver by truck.

Filled cases are moved across the aisle on a slide table at each line. Note the clear passage

BETTER FLAVOR DEVELOPED *in Cocoa by* IMPROVED ROASTING METHODS

By FRANK C. GEPHART
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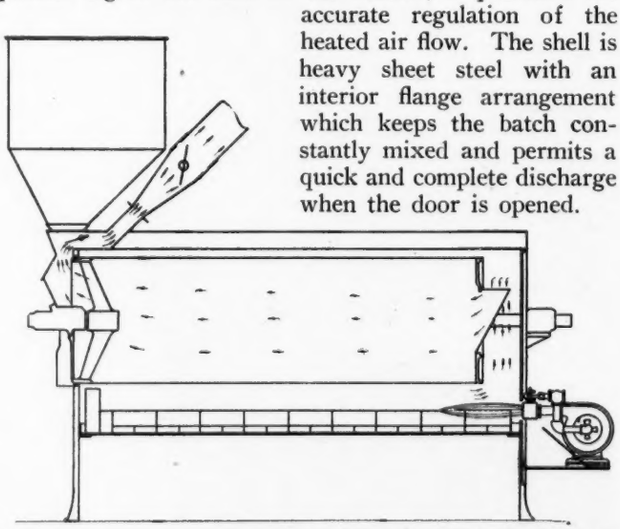
THE importance of cocoa as a foodstuff is at once realized when it is considered that approximately 200,000 tons of raw cocoa beans are consumed in this country annually, this quantity being about 40 per cent of the world's total consumption. Cocoa products will continue to occupy this position among American food products because during the last twenty years their consumption has increased steadily from about 40,000 tons to the present quantities, the greatest increase occurring in 1916 during the World's War, when consumption was about 100,000 tons. Since 1916 consumption has almost doubled and seems to be maintaining its present high level. Cocoa's great popularity as a foodstuff has resulted from the recognition of its food value by the American public during the World's War and the ever-increasing improvement in the quality of the many products manufactured from it.

Cocoa beans, the basic material from which all chocolate products are made, exist in several varieties, each possessing individual characteristics of size, color, shape, flavor quality, cup quality, etc. Apart from differences in elementary composition, the manufacturer is most concerned with the problem of maintaining a standardized product with respect to color, flavor, appearance and eating qualities. These qualities can be maintained only by a careful selection of beans and by controlled handling of the product during its process of manufacture. The very best of raw materials may not always produce the best finished product unless extreme care is exercised in roasting, cleaning, milling, packaging and storing.

Of all these manipulations roasting is, perhaps, the most important and is the first step in the preparation of the great variety of chocolate products found on the market today. Roasting performs two important functions; it renders the shell more friable and easily removable when the beans are cracked, and it develops the sensitive flavor and aroma of the finished product. Cocoa beans roasting is usually conducted in rotary roasters, each carrying a charge of about 400 lb. The source of heat may be direct heat, gas or steam.

The latest type of roaster is that shown in the accompanying photograph and diagram and is known as the Burns No. 25 Roaster. It introduces a new method of roasting cocoa beans and supersedes the standard gas fired roaster manufactured by that firm for years. The new feature of this roaster is embodied in the manner of applying heat by a method which permits greater uniformity in roasting and minimizes the danger of scorching. In the old type of roaster heat was applied externally to the revolving cylinder, either by a gas or a direct coal fire. Roasting is accomplished in the new type by a flow of clean hot air which penetrates uniformly into every portion of the cylinder, assuring a uniform application of heat and carrying off steam, smoke, dust, hulls and other waste from the roast. It is claimed that this roaster produces a cleaner, brighter and more uniform roast than that produced in the old type without adequate ventilation, producing a superiority of quality of the roasted beans and purity and delicacy of their flavor.

The heating equipment of this new roaster is similar to that used in the standard coffee roasters. It is a gas burner of the most efficient motor driven type which throws an intensely hot flame into a special chamber in the lower section of the roaster. Heated air from this chamber is drawn through the unperforated cylinder, from back to front, where it gives up its heat and sucks out the smoke and dust. To maintain a uniform flow of hot air at the proper speed, an artificial suction is applied to the roaster draft pipe by means of a small exhaust fan (having an outdoor discharge) or by a connection from a larger fan serving several roasters, or else by suction from a part of the cooler equipment. An adjustable suction control is located in the draft pipe and a secondary damper operated by a handy dial-and-pointer rig at the base of the roaster, is provided for accurate regulation of the heated air flow. The shell is heavy sheet steel with an interior flange arrangement which keeps the batch constantly mixed and permits a quick and complete discharge when the door is opened.



Courtesy Jabez Burns & Sons, Inc., New York, N. Y.

Method of heat application in Burns No. 25 cocoa roaster

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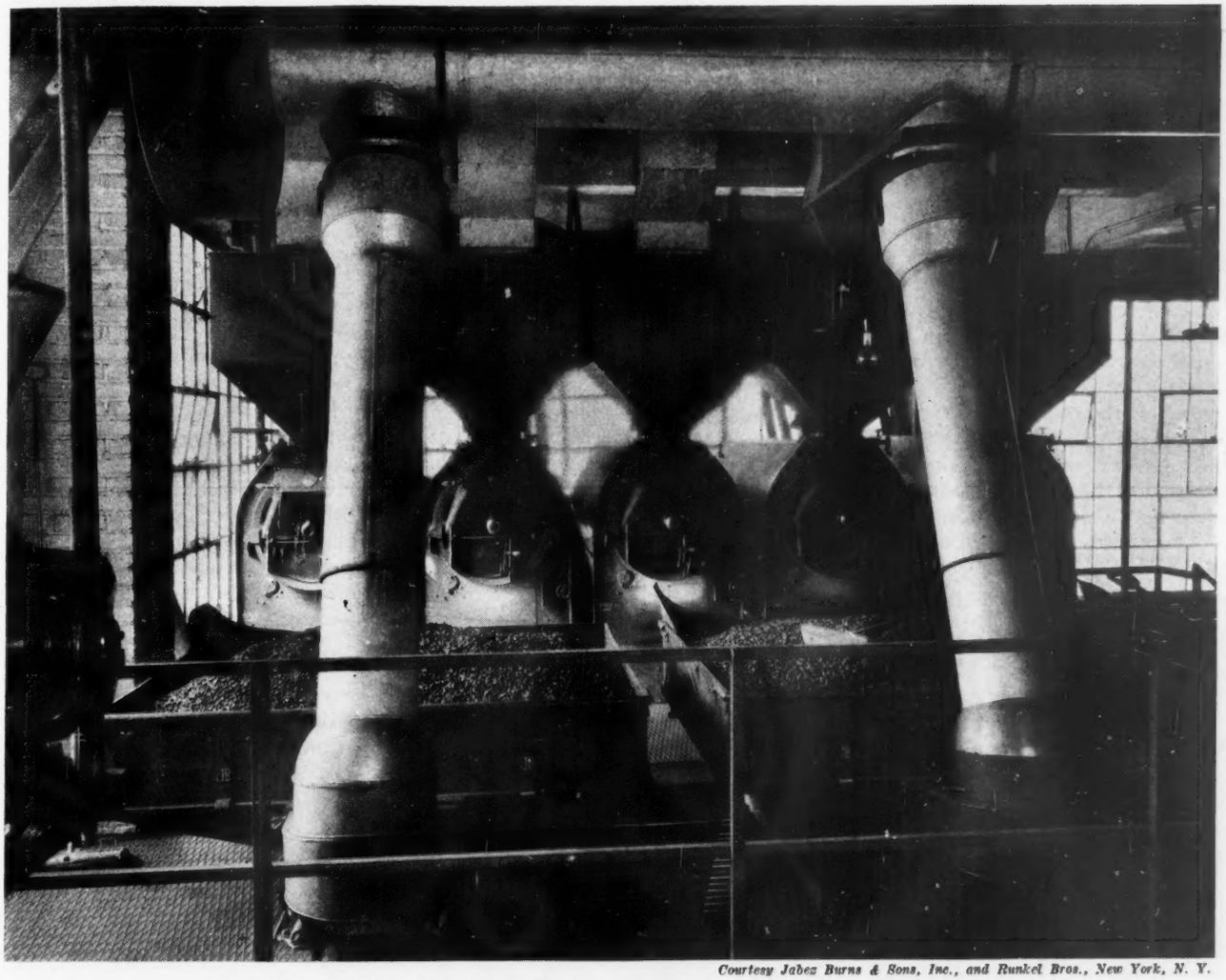

Courtesy Jabez Burns & Sons, Inc., and Runkel Bros., New York, N. Y.

Front view of battery of five Burns No. 25 roasters operating in plant of Runkel Brothers

The roaster is insulated to effect heat economy. It is claimed to be more efficient than the old type, roasting in less time and using less heat. The principle of its construction, namely, the internal application of heat into an insulated revolving cylinder possessing regulated ventilation, unquestionably provides a more efficient roaster. It takes a charge of 550 to 600 pounds of raw cocoa, an increase in capacity of 20 to 25 per cent over the former type.

Cocoa is usually roasted before blending because the lack of uniformity in the size and shape of the various varieties of bean requires different temperatures and different time periods to bring out their best qualities. The temperatures used range between 100 deg. and 135 deg. C., depending upon whether a low or high roast is desired. After roasting the charge is dropped into exhaust coolers where it is cooled rapidly to prevent over-roasting from its self-contained heat. The color of the finished product may be controlled to a great extent by the manner in which this operation is conducted; high roasting usually imparting a deeper color.

Considerable scientific work has been reported on the changes effected by the process of roasting. Apart from anticipated changes, such as loss of moisture and caramelization of starch, it is well agreed that there is a loss of astringency due to some change in the tannin complex. It has been reported by several and disputed by an equal number, that there is a loss of theobromine. The question is a difficult one to decide as raw beans present difficulties of analysis not shown by roasted beans. The theobromine content is about one per cent in the raw nib and is reported as about three-fourths of one per cent in the same nibs after roasting for 15 minutes at 120 deg. C. There seems to be an increase of fat during the first stages of roasting, followed by a loss of fat after prolonged roasting. Here again we must be careful in drawing conclusions because the determination of fat in raw cocoa beans is quite a different matter from its determination in the roasted nib. The results may properly be ascribed to the fact that roasting releases the fat from the cellular structure of the bean and renders it more readily extractable. The determination of fat in cocoa products by the usual methods of analysis is only reliable when applied to finely divided materials and raw beans are extremely difficult to grind. It is easy to understand the loss of fat by prolonged roasting, for one only has to examine the exhaust of the roaster in order to satisfy himself that fatty materials are volatilizing.

By far the most important change effected by roasting is the development of the aroma of the product. When raw fermented beans are received at the manufacturing plant they possess an odor resembling vinegar, due to the presence of acetic acid and acetic acid esters produced during the process of fermentation which are not wholly removed by the subsequent washing and drying processes. The more readily volatile esters and free acids escape while roasting proceeds and the roast is considered to be complete when the "vinegar" odor is no longer

discernible. At this stage it is considered that the true aroma of chocolate has been developed.

In developing the aroma it is assumed that some chemical change has taken place between the various constituents of the bean which produces the net result—the aroma of chocolate. It might be assumed equally well, especially in the absence of scientific facts to the contrary, that the resulting flavor of chocolate is not the result of inter-action of the various constituents brought about by heat, but that it is merely the residual flavor of the unroasted beans which has not been volatilized by heat. A certain amount of credence is attached to this theory because variations in roast, both in respect to temperature and duration, produce in the same bean a variation of aroma. Furthermore, the manner and sequence of the roast affects the aroma of the product as is exhibited by the Lindt chocolate, a chocolate whose flavor is developed slowly by heat treatment following a low initial roast, and having a flavor totally different from that which would result from a short high roast.

The most valuable work that has been performed on the subject of chocolate aroma is that of Bainbridge and Davies, working in the plant of Cadbury in England. These two investigators subjected about 2,000 kilos of low roasted Caracas beans to steam distillation and were able to recover about 24 grams of volatile oil from the distillate. This oil possessed a remarkably true chocolate odor and high chocolate flavoring properties. The purpose of this investigation was to determine, if possible, the chemical composition of the odorous principle of chocolate. They subjected the volatile oil to fractional distillation and attempted to make chemical analyses of the various fractions. Although they were unable to identify completely all of the constituents present, they did find a substantial amount of d-linalool and noted that the distillates possessed an odor resembling coriander. Due to the fact that the chemistry of odorous substances has never been fully developed, because of its great complexity, a complete analysis of the various distillates could not be made.

Of all the literature on the subject of the chemistry of chocolate, the work of Bainbridge and Davies stands out as, perhaps, the most courageous. It was an exceptionally well planned and carefully conducted piece of work. It was an enormous undertaking and although it did not completely answer the question of the chemical make-up of the aroma of chocolate, it did furnish us with a great deal of valuable information on the subject which should stimulate others to continue the study especially as there have been developed numerous improvements and new methods for the analysis of odorous substances since this investigation was undertaken. By applying the latest methods of analysis and extending the study to a great variety of beans roasted under various conditions, a reinvestigation of this subject would supply scientific data of inestimable value.

I believe that roasting is, perhaps, the most important single operation in the manufacture of chocolate, certainly it is the operation that will either make or break the product. It is unfortunate that we do not possess more scientific knowledge concerning this most important matter.

Courtesy Jabez Burns & Sons, Inc., and Runkel Bros., New York

Rear view of battery of five Burns No. 25 roasters operating in plant of Runkel Brothers. Note gas injectors.

The BACTERIAL CONTENT *of Raw and Commercial* SUGARS

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Photograph, Ewing Galloway

By LAWRENCE H. JAMES

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THE interest of bacteriologists has been turned recently to the microbial flora of sugar (sucrose) by the recent studies of Weinzirl (1927) of the occurrence of colon bacilli on candies; of Church, Paine and Hamilton (1927), which demonstrate the importance of sugar-tolerant yeasts in the bursting of chocolate-coated creams, and of Cameron and Williams (1928), which indicate the importance of certain flora of granulated sugar to the canning industry. In view of the possibility of sugar being an infective agent in sweetened foodstuffs, the bacteriology of the product assumes a position of considerable significance.

Few investigations of the effect of the bacterial flora of sugars on food products to which the sugar is added have been made. The investigation by Cameron and Williams in which they studied sugar as a source of thermophilic spoilage bacteria is of significance to the canning industry. Analyses by the author (1928) confirmed their isolation of the "flat sour," "hard swell" and "sulfur" thermophiles from sugar. All other studies of the bacteriology of sugar have been made for the purpose of determining the agents responsible for the deterioration of either unrefined or granulated sugar. Because of the close relationship between the microbial deterioration and the flora of market sugars, the following brief review of the recent outstanding investigations of sugar deterioration is given.

The investigations of Owen (1911), in which he determined the types of organisms usually found in sugar, their morphological and cultural characteristics as well as their ability to break down sucrose under different conditions, led him to the conclusion that the deterioration of cane sugar is caused by the "potato group of bacilli." He found that the spores of these organisms were "highly resistant to heat," and survived "different processes of manufacture, thus forming in part the contamination of the final products." After studying the deterioration of cane sugars in storage, Owen (1918) later concluded that the loss of sucrose was caused largely by molds and yeasts, and further that "The bacteria can only cause the deterioration of sugars which have absorbed a comparatively large amount of moisture." Following the claim by Owen that molds and yeasts were responsible for sugar deterioration, Kopeloff and Kopeloff (1919) isolated a large number of fungi from sugars and studied their effect upon raw and granulated cane sugar.

In studying the deterioration of raw cane sugar, Browne (1918), after a careful review of the literature, reported the isolation of large numbers of *Torula communis,* which he showed grew in sugar solutions from the dilute to the most concentrated. Special cases of deterioration of sugar he attributed to the two types of *Monilia, Monilia nigra* and *Monilia fusca,* both of which actively invert sucrose.

IN THE investigation reported here the author's attention was directed particularly to organisms of those types which might be of importance in the spoilage of food products to which the sugar is added. In the analysis of solid materials, representative sampling is always difficult but the larger the sample the more nearly the difficulty is overcome. Most sugar analyses have been made on the basis of one gram quantities, which is too small to be representative. In order to make the work indicative of actual conditions, 20 grams of each sample were dissolved in 88 c.c. of sterile water, and aliquots and dilutions thereof were inoculated into the test media. In order that organisms which were present in small numbers only might be detected a sufficient amount of the sugar solution was added to the test media so that a total of at least five grams of sugar had been added.

This was distributed among five plates or tubes resulting in an inoculation of one gram of sugar per plate or tube. In plating 5 cubic centimeters of liquid it is necessary to use about 15 cubic centimeters of plain agar (1.5 per cent agar) to produce good solidification. Thus on incubation such plates contained approximately 20 c.c. of media of 5 per cent sucrose content. Single dilutions were made by inoculating plates and tubes with one-half cubic centimeter of the test sugar solution. The addition of 10 c.c. of medium to the one-half c.c. of sugar solution resulted in a sugar concentration of about 0.1 per cent.

Owen (1914-15) showed that the highest aerobic total counts were obtained on a sucrose medium. . In the present investigation the technic described above met most of the necessary conditions as nearly as practicable in the examination of a large series of samples, because counts were obtained in media containing 5 per cent and 0.1 per cent sucrose, respectively.

IN THE examination of the sugar samples in this survey the total numbers of organisms of the following types were determined:

A. Aerobic, saprophytes
   1. Growing at 30 deg. C.
   2. Growing at 55 deg. C.

B. Putrefactive anaerobes (37 deg. C.)

C. *B. coli* (37 deg. C.)

D. Spoilage thermophiles (55 deg. C.)
   1. "Flat sour" types
   2. "Hard Swell" type
   3. *Cl. nigrificans* or "sulfur" type

On duplicate agar plates at 30 deg. and 55 deg. C. there is undoubtedly some overlapping of the types growing, since many of the organisms grew as well at 30 deg. as at 55 deg. C. A marked difference in the total counts at the two temperatures indicates whether or not the majority of those growing on the medium are thermophilic. The total numbers of putrefactive anaerobes were determined approximately by the number of tubes of the six inoculated (five containing 5 c.c. of sugar solution each, and one containing one-half c.c. of sugar solution) which showed gas production and which was later proved to be caused by putrefactive anaerobic organisms. The addition of the sugar to the culture medium made it imperative that transfers be made from all tubes showing gas production to fresh media containing no added sugar. The figures listed under "Putrefactive Anaerobes" in the accompanying tables represent only those cultures which have been confirmed by this method. The ciphers marked with an asterisk indicate tubes in which gas was produced but in which the presence of putrefactive anaerobes was not confirmed. In the foregoing tests the tubes of beef infusion broth were sealed with agar after the addition of the sugar solution.

In the tests for *B. coli* 5 c.c. and 0.5 c.c. of sugar solution were added to lactose broth. When, on incubation, gas was produced, the presence of *B. coli* was confirmed or disproved by transferring to Endo agar and inoculating the typical colon colonies into lactose broth. Gram stains were also made from the typical colonies on Endo agar. In testing for spoilage thermophiles the same quantities of sugar solution were added to the media as were used in the other tests, namely, 5 c.c. and 0.5 c.c. In these analyses the sugar solutions were not heated to destroy vegetative forms, a procedure which would have been incompatible with the purposes of the investigation. The "sulfur" type of thermophile was identified as the organism described and named *Cl. nigrificans* by Werkman and Weaver (1927), and the "flat sour" types were identified according to the classification of Cameron and Esty (1926).

TABLE I—RESULTS OF THE EXAMINATION OF 50 SAMPLES OF RAW "CENTRIFUGAL" SUGARS. BACTERIA PER 5 GRAMS.

No.	B. Coli. Lact. Bro.	B. Coli. Conf'd	Total Count 30°	Total Count 55°	Putrefactive Anaerobes	Spoilage Flat Sour	Thermophiles Sulphur	Thermophiles Hard Swell
B 2	+	—	1,150	375	6	8	0	0
B 3	+	—	1,400	475	6	70	0	0
B 4	+	—	2,300	400	6	100	1	0
B 5	—	..	150	102	2	0	0	0
B 6	—	..	87	2,100	3	1,200	0	0
B 7	—	..	135	475	0	33	0	1
B 8	+	—	30,750	30,000	50	2,200	0	0
B 9	+	—	5,000	100	5	12	0	0
B 10	+	—	2,750	400	0*	6	0	0
B 11	+	—	1,000	110	5	0	0	2
B 12	+	—	1,250	400	5	52	0	0*
B 13	+	—	3,000	150	3	40	0	1
B 14	+	+	2,500	140	0*	8	0	0*
B 15	+	+	4,000	400	50	11	0	0
B 16	+	—	4,000	715	3	73	0	0*
B 17	+	—	2,750	450	50	20	0	0*
B 18	+	—	2,650	500	3	90	0	0
B 19	+	—	3,500	500	4	220	0	0
B 23	+	—	1,500	125	5	102	0	0
B 24	+	—	750	350	4	85	0	0
B 28	+	—	2,800	375	4	11	0	0*
B 29	+	—	1,000	200	50	20	0	0*
B 30	+	—	4,500	1,500	50	28	0	0
B 31	+	—	1,000	850	2	79	0	0
B 32	—	..	1,500	500	1	0	0	0
B 33	+	—	900	500	0*	147	0	0
B 34	+	—	210	155	4	0	0	0
B 35	—	..	600	1,200	2	42	0	0
B 36	+	—	3,000	750	0*	800	0	0
B 37	—	..	625	150	3	270	0	0
B 38	+	—	300	600	4	16	0	0
B 45	+	—	3,000	1,250	0*	0	0	0
B 46	+	—	1,500	85	0*	0	0	0
B 47	+	—	2,000	450	0*	12	0	0
B 48	+	—	3,000	80	4	0	0	0
B 49	+	—	1,400	600	0*	4	0	0
B 50	+	—	1,750	325	0	0	0	0
B 53	+	—	750	550	2	0	0	0
B 54	+	—	700	500	3	14	0	0
B 55	+	—	525	115	5	15	0	3
B 56	+	—	700	385	1	0	4	0
B 57	+	—	1,100	985	1	0	0	0
B 58	+	—	1,130	255	2	0	1	0
B 59	+	—	2,500	500	5	20	6	1
B 60	+	—	2,000	355	2	0	1	0
B 61	+	—	4,600	500	0	5	0	0*
B 63	+	—	1,800	75	4	36	0	0*
B 64	+	—	1,400	20	0	0	1	0
B 65	+	—	2,250	300	3	0	0	0
B 66	+	—	1,100	650	3	0	0	0

*Gas produced in tubes of beef infusion, but the presence of anaerobes unconfirmed.

The majority of the "granulated" and "commercial soft" sugar samples were obtained directly from the retail market, in different parts of the United States, through the generous co-operation of the field service of the Food, Drug and Insecticide Administration of this Department. Occasionally it was difficult to obtain samples which could be identified with any particular refinery. To obviate this difficulty certain samples were obtained directly from sugar refineries or factories. Most of the samples were obtained from the open market, however, and represent general market conditions over a wide area of the country.

The raw sugar samples were collected by the sugar sampler at the dock in New York and were composites of samples from a number of bags of each shipment. They were placed in sterile glass-stoppered bottles and shipped immediately to the laboratory in Washington. The 50 raw sugar samples represent 50 different plantations, 46 in Cuba and 4 in the Philippine Islands. The "brown," granulated, confectioner's and powdered sugar samples were obtained in original containers as far as possible. The factory origins of the samples were as follows:

A. 22 brown sugar samples (soft grades) represented 13 different refineries.

TABLE II—RESULTS OF THE EXAMINATIONS OF 22 SAMPLES OF COMMERCIAL "BROWN" SUGARS. BACTERIA PER 5 GRAMS.

No.	B. Coli. Lact. Bro.	B. Coli. Conf'd	Total Count 30°	Total Count 55°	Putrefactive Anaerobes	Spoilage Flat Sour	Thermophiles Sulphur	Thermophiles Hard Swell
B 1	—	..	85	1,250	1	72	1	0
B 20	+	—	7,500	6,300	50	900	0	0
B 21	—	..	2,900	11,850	5	15,000	0	0
B 22	+	—	200	1,000	2	10	1	0
B 25	+	—	200	125	50	31	1	0
B 26	+	—	120	105	0	31	0	0
B 27	—	..	260	100	1	11	5	0
B 39	—	..	60	550	0	4	0	1
B 40	+	—	125	1,200	3	5	1	3
B 41	+	—	200	4,000	2	100	6	1
B 42	—	..	400	550	2	0	16	0
B 43	+	—	90	17	0	4	0	0
B 44	+	—	285	100	3	12	1	0
B 51	+	—	55	42	0	0	0	0
B 52	—	..	57	110	0*	8	0	0
B 62	+	—	1,250	650	50	0	1	0
B 67	+	—	250	750	3	24	0	1
B 68	—	..	42	40	1	0	0	2
B 69	—	..	130	135	0	0	0	0
B 70	—	..	7	125	0	10	0	0
B 71	—	..	150	17	0	0	5	0
B 72	+	—	130	72	3	17	0	0

*Gas produced in tubes of beef infusion, but the presence of anaerobes unconfirmed.

B. 37 granulated cane sugar samples represented 20 different refineries.

C. 64 granulated beet sugar samples represented 55 different factories.

D. 24 powdered and confectioner's cane sugar samples represented 14 different refineries.

In Table I are listed the results of the analyses of 50 samples of plantation centrifugals (raw sugar). The figures represent the number of organisms per 5 grams of sugar.

B. coli was isolated from two samples. The total counts of viable organisms growing at 30 deg. C. is generally a thousand or more in 5 grams or 200 per gram of sample. Comparison of the counts obtained at 30 deg. C. with those recorded at 55 deg. C. shows a marked prevalence of mesophilic types. In only 4 samples was the thermophilic count higher than the 30 deg. count. The presence of putrefactive anaerobes in 38 of the samples indicates the heavy contamination entering the sugar refineries. The occurrence of gas in the original beef infusion tubes from which anaerobes could not be isolated is probably owing to the presence of anaerobic organisms capable of producing gas from the added sucrose, but not from the beef infusion alone. Several such organisms have been found. The tests for thermophilic spoilage organisms show an abundance of "flat sour" thermophiles (present in 68 per cent of the samples) and the presence of "sulfur" or "hard-swell" types in only 20 per cent of the samples. The "flat sour" types were present in comparatively large numbers, but in no case were as many as two per gram of the other spoilage types found.

The frequency with which gas was produced in lactose broth but in which *B. coli* was not confirmed is closely allied to the identification of anaerobes at 37 deg. C. In 42 of the 50 samples gas was observed in lactose broth, but colon bacilli were not obtained. Of these 42 samples, 32 contained 37 deg. anaerobes. These observations support recent studies of the formation of gas in lactose broth by anaerobic types and further emphasize the importance of the confirmation of *B. coli* in water analysis.

The commercial "soft" or "brown" sugars are made by the evaporation and crystallization of mother liquors, sirups, etc., obtained in the manufacturing processes, in such a way as to yield a product of small grain which will retain by absorption as much as possible of the adhering liquors. Since the bacteria and bacterial spores are carried primarily in the liquors and since the processes of manufacture do not result in sterilization, "soft" sugars carry greater numbers of microörganisms than do the granulated sugars, but fewer than the raw sugars. In Table II are given the results of the analysis of 22 samples of "brown" sugar obtained from the retail market, most of which were bought in the original containers.

No colon bacilli were isolated, although gas was produced in lactose broth from more than half the samples. Spoilage thermophiles of the "flat sour" type were prevalent, being isolated from 72 per cent of the samples, whereas the "sulfur" or "hard swell" types were present in about 60 per cent of the samples, a much higher figure than that obtained from the raw sugars.

In the examinations of the granulated cane sugar samples the total counts at 30 deg. and 55 deg. were somewhat lower than similar determinations on the raw sugars. In the granulated cane sugar, however, 13 of the 37 samples showed markedly higher total counts at 55 deg. than at 30 deg. C., indicating that the microbial flora of granulated cane sugar is made up of a much higher percentage of the thermophilic forms than is that of the raw sugar entering the refinery, namely, 35 per cent and 8 per cent, respectively.

THE number of "flat sour" thermophiles markedly decreased during the passage of the sugar through the refinery, 75 per cent of the samples showing none of these organisms. Twelve per cent of the raw sugar samples carried the "sulfur" spoilage thermophile, whereas 35 per cent or almost three times as many of the granulated cane sugar samples carried it.

In the manufacture of sugar from beets the procedure differs somewhat from that of the preparation of cane sugar. Since the beets are grown in fertilized soil, and since thermophiles are abundant in animal fertilizer, beet sugar might be expected to contain large numbers of thermophilic spoilage types. The examina-

TABLE III—RESULTS OF THE EXAMINATIONS OF 37 SAMPLES OF GRANULATED CANE SUGAR. BACTERIA PER 5 GRAMS.

No.	B. Coli. Lact. Bro.	B. Coli. Conf'd	Total Count 30°	Total Count 55°	Putrefactive Anaerobes	Spoilage Flat Sour	Thermophiles Sulphur	Thermophiles Hard Swell
A 1	+	—	90	180	9	10	50	0
A 2	—	..	10	68	50	0	2	0
A 3	—	..	5	28	0	2	1	0
A 4	+	—	2,100	28	6	1	0	0
A 5	+	—	275	130	6	4	1	1
A 6	+	—	100	140	5	0	1	0
A 7	+	—	140	45	5	0	25	0
A 8	—	..	60	20	5	20	4	0
A 9	—	..	5	9	0	23	0	0
A 11	+	—	92	60	5	0	0	0
A 12	—	..	35	55	1	0	0	0
A 13	+	—	3,000	500	2	350	0	0
A 14	+	—	58	230	5	33	3	0
A 15	+	—	400	350	5	0	31	0
A 16	+	—	70	45	3	0	0	0
A 31	—	..	12	425	0	0	11	2
A 32	—	..	50	210	0	0	0	0
A 33	—	..	35	110	0	0	0	0
A 34	—	..	30	15	3	0	0	0
A 35	—	..	8	0	0	0	0	0
A 36	—	..	3	5	0	0	0	0
A 37	—	..	5	12	0	0	0	0
A 38	+	—	175	40	0	0	3	0
A 39	+	—	100	8	3	3	1	0
A 63	+	—	20	30	2	0	0	0
A 64	+	—	32	35	4	0	0	0
A 79	—	..	10	10	0	0	0	0
A 80	—	..	180	72	0	0	0	0
A 85	—	..	75	3	0	0	1	0
A 86	—	..	9	0	0	0	0	0
A 87	—	..	38	190	0	0	0	0
A 88	—	..	68	28	0	0	0	0
A 89	—	..	7	43	0	0	0	0
A 90	—	..	27	82	0	0	0	0
A 91	+	—	108	94	2	0	0	0
A 92	+	—	18	63	2	0	0	0
A 93	—	..	570	245	0	0	0	0

TABLE IV—RESULTS OF THE EXAMINATIONS OF 64 SAMPLES OF GRANULATED BEET SUGAR. BACTERIA PER 5 GRAMS.

No.	B. Coli. Lact. Bro.	B. Coli. Conf'd	Total Count 30°	Total Count 55°	Putrefactive Anaerobes	Spoilage Flat Sour	Thermophiles Sulphur	Thermophiles Hard Swell
A 10	—	..	350	150	3	2	0	3
A 17	—	..	525	155	2	0	0	0
A 18	+	—	250	50	1	0	0	0
A 19	+	—	35	80	0	8	0	0
A 20	+	—	85	35	0	5	0	0
A 21	—	..	32	35	0*	2	0	0
A 22	+	—	50	75	1	0	0	0
A 23	—	..	500	240	2	0	0	0
A 24	—	..	400	70	0	1	0	0
A 25	—	..	4	60	1	0	0	0
A 26	+	—	115	55	4	0	0	0
A 27	—	..	525	60	0	0	0	0
A 28	+	—	190	45	3	0	0	0
A 29	—	..	800	32	0	0	0	0
A 30	—	..	1,250	50	0	0	0	0
A 40	+	—	510	12	1	0	0	0
A 41	—	..	800	15	0	0	0	0
A 42	+	—	300	2	0	0	0	0
A 43	+	—	100	9	0	5	0	0
A 44	—	..	80	85	0	10	0	0
A 45	+	—	900	15	0	0	0	0
A 46	—	..	155	12	0	0	0	0
A 47	—	..	50	30	0	0	0	0
A 48	—	..	3	8	0	0	0	0
A 49	+	—	20	3	0	0	0	0
A 50	—	..	135	15	0*	0	0	0*
A 51	—	..	8	50	0	0	0	0
A 52	—	..	57	55	0	0	0	0*
A 53	+	—	110	20	0	5	0	0*
A 54	+	—	20	50	0	15	0	0*
A 55	+	—	150	122	2	0	0	0
A 56	—	..	17	3	0	0	0	0
A 57	+	—	150	5	0	0	0	0*
A 58	—	..	25	8	0	0	0	0
A 59	—	..	20	5	2	0	0	0*
A 60	—	..	55	12	0	2	1	0
A 61	—	..	475	18	0	0	0	0
A 62	—	..	100	12	0	0	0	0
A 65	..	..	.....	.....	..	..	..	..
A 66	+	—	250	55	0	0	0	0
A 67	+	—	275	25	0	0	0	0
A 68	+	—	750	280	0	0	8	5
A 69	+	—	115	10	0	0	0	0
A 70	—	..	160	170	0	5	1	0
A 71	—	..	100	35	4	0	0	0
A 72	—	..	45	9	0	0	0	0
A 73	+	—	93	0	0	0	0	0
A 74	—	..	53	15	0	0	0	0
A 75	—	..	24	30	0	0	0	0
A 76	—	..	80	9	0	1	0	0
A 77	—	..	200	75	0	0	0	0
A 78	—	..	115	160	0	0	0	0
A 81	—	..	8	9	0	0	0	0
A 82	—	..	245	8	0	0	0	0
A 83	—	..	310	60	0	0	0	0
A 84	+	—	142	50	2	0	0	0
A 94	+	—	278	28	4	0	0	0
A 95	—	..	300	12	3	0	0	0
A 96	—	..	15	8	0	0	0	0
A 97	+	—	700	250	2	0	0	1
A 98	—	..	450	8	0*	0	0	0
A 99	—	..	122	55	3	7	0	0
A 100	+	—	400	18	2	0	0	0
A 101	+	—	250	45	0	8	0	0
C 15	+	—	1,000	900	2	0	0	2

*Gas produced in tubes of beef infusion, but the presence of anaerobes unconfirmed.

tions of 64 beet sugar samples showed, however, that this is not true (Table IV). In fact, "flat sour" thermophiles were found in 21 per cent of the beet sugar samples and in 25 per cent of the cane sugar samples. *Cl. nigrificans* was isolated from 3 per cent of the granulated beet sugar samples, but was found in 35 per cent of the granulated cane sugar samples. Further, in the examinations of the beet sugar samples markedly higher total counts at 55 deg. C. were obtained in only 5 or 7 per cent of the samples, as compared to 35 per cent in the granulated cane sugar samples.

In Table V are listed the results of the analyses of 24 samples of "powdered" and "confectioner's" cane sugar. A number of the confectioner's sugars sold on the market contain about 3 per cent of starch which is added to facilitate the preparation of confections. Eleven of the samples examined contained added starch, as indicated in Table V. It is significant that all but one of the samples, with a total bacterial count at 30 deg. C. of more than 1,000, contained added starch. Further, 63 per cent of those containing starch carried more than 1,000 organisms per 5 grams. The proportions of total counts obtained at 30 deg. C., of 1,000 or more per 5 grams of sugar, are as follows:

Raw sugar	Table I	74 per cent
"Brown" sugar	Table II	13 per cent
Granulated cane sugar	Table III	5 per cent
Granulated beet sugar	Table IV	3 per cent
"Powdered," "Confectioner's" cane sugar	Table V	33 per cent

B. coli was not isolated from any marketable sample of sugar. Putrefactive anaerobes were isolated from sugar of all types tested, though they were considerably more abundant in the raw product. Their importance in the spoilage of foods is dependent upon conditions favorable for their development. Their introduction with the sugar makes possible an anaerobic decomposition, simultaneous with aerobic or facultatively anaerobic spoilage by organisms which often occur normally in food products. The importance of the spoilage thermophiles, which are extremely resistant to heat, in the canning of non-acid food products, such as vegetables, is self-evident.

TABLE V—RESULTS OF THE EXAMINATIONS OF 24 SAMPLES OF "POWDERED" AND "CONFECTIONERS" CANE SUGAR. BACTERIA PER 5 GRAMS.

No.	Starch	B. coli. Lact. Broth	B. coli. Conf'd	Total Count 30°	Total Count 55°	Putrefactive Anaerobes	Spoilage Flat Sour	Thermophiles Sulphur	Thermophiles Hard Swell
C 1	X	+	—	27,000	200	1	2	0	3
C 2	..	—	..	0	37	0	27	0	0
C 3	X	+	—	15,000	300	1	35	0	0
C 4	X	—	..	30	37	0	0	0	0
C 5	..	—	..	20	22	1	0	0	0
C 6	..	—	..	55	8	2	0	0	0
C 7	..	+	—	750	750	4	5	0	0
C 8	..	—	..	107	190	0	0	0	0
C 9	X	+	—	300	20	2	0	0	0
C 10	..	—	..	5,000	30	2	0	0	0
C 11	..	+	—	21	23	2	0	0	0
C 12	X	+	—	1,010	25	1	0	0	0
C 13	..	—	..	38	40	0	0	3	0
C 14	X	+	—	1,300	220	0	5	1	0
C 16	X	+	—	685	633	0*	5	2	0
C 17	X	+	—	3,175	2,100	4	3	0	0
C 18	..	+	—	350	62	50	0	1	0
C 19	..	+	—	80	12	0	0	1	0
C 20	X	+	—	1,200	82	50	0	0	0
C 21	X	—	..	246	22	0	0	0	0
C 22	..	+	—	112	71	50	0	0	0
C 23	..	—	..	13	15	0	0	0	0
C 24	X	—	..	2,300	300	0	35	0	0
C 25	..	—	..	122	111	2	5	0	0

*Gas produced in tubes of beef infusion, but the presence of anaerobes unconfirmed.

Summary

1. Bacteriological examinations of 197 samples of sugars were made for microörganisms of the following types:

A. Aerobic saprophytes
   a. Growing at 30 deg. C.
   b. Growing at 55 deg. C.
B. Putrefactive anaerobes (37 deg. C.)
C. *B. coli.*
D. Spoilage thermophiles (55 deg. C.)
   a. "Flat sour" types
   b. "Hard swell" types
   c. *Cl. nigrificans* or "sulfur" type

2. Of the 197 sugar samples examined:

A. 50 were raw sugar, representing 50 different plantations, 46 in Cuba and 4 in the Philippine Islands
B. 22 were commercial "brown" cane sugar and represented 13 different refineries
C. 37 were granulated cane sugar and represented 20 different refineries.
D. 64 were granulated beet sugar and represented 55 different factories.
E. 24 were "powdered" and "confectioner's" cane sugar and represented 14 different refineries.

3. Aerobic saprophytes, generally members of the subtilis group, were found in all samples, raw sugar containing the most and the granulated sugars the least.

4. The occurrence of thermophilic saprophytes in greater numbers than the mesophilic saprophytes was found more often in granulated cane than in sugar of any other type examined.

5. *B. coli* was insolated from only two samples of raw sugar.

6. Putrefactive anaerobes were isolated from sugar of all types examined, and from a large percentage of the samples.

7. Spoilage thermophiles were isolated from sugar of all types examined.

A. Raw cane sugar contained the "flat sour" types in large numbers, and very few of the "sulfur" and the "hard swell" types.

B. Commercial "brown" sugars contained the "flat sour" types in comparatively large numbers and more than half the samples contained the "sulfur" or "hard swell" types.

C. Granulated cane sugar contained fewer of the spoilage thermophiles than any of the other sugars referred to above, their presence, however, was more marked in the granulated cane than in the granulated beet sugar.

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U. S. Tomato Packers Demand Tariff Relief

With Italian canned tomatoes entering the United States in quantities increasing every year the whole tomato canning industry of this country is seriously affected, and in eastern territory alone, Frank M. Shook of Easton, Maryland, Secretary of The Tri-State Packers Association comprising Delaware, Maryland and New Jersey, in a hearing before the Tariff Commission, testified that there were 181 idle canning factories. The competition of Italian tomatoes, he said, is responsible for this loss of business to American manufacturers.

Packers of tomatoes in the largest tomato growing regions of Indiana, California and the Tri-States agree that the only practical relief from this increasing flood of foreign tomatoes is an increase of import duty 41 per cent.

Opposition to the proposed increase in import duty was voiced by Charles S. Tosi of New York in behalf of Italian tomato importers who contend that the marked disparity of costs of manufacture with those abroad is due to inefficiency of American producers.

In connection with the report of the tariff hearing of interest is the following report from the American Consul at Naples, S. B. Redecker, recently released by the Department of Commerce. It is possible that there is some connecting influence between the increased number of Italian canning factories and the increasing market in this country.

The report follows:

"Present indications are that the tomato crop in the Naples district will be very good this year, according to a report of June 12, from American Consul S. B. Redecker at Naples. The tomato crop in this district is very important, this area being one of the chief sources of supply for this product in Italy and the Naples canning industry.

"It is reported that a number of *new and small canning establishments* (the italics are ours) have been established in the Naples district, chiefly in the neighborhood of Salerno. These factories, together with the large factories already established, are making preparations for carrying on the canning operations during the tomato season. It is thought that the presence of the new canning concerns will increase the competition of canners in the purchase of tomatoes with the result that prices may be held at fairly high levels.

"It is the opinion in local trade circles that but for the increased demand from the new small canners, the price for tomatoes secured by the farmers might average around 30 lire to 35 lire per metric quintal, approximately 74 to 84 cents per 100 pounds, but with the increased demand farmers would appear to be expecting to receive for their crops as high as 50 lire per quintal, approximately $1.20 per 100 pounds."

MOBILE REFRIGERATION

By Solid Carbon Dioxide

"Dry-Ice" ten times as potent as an equal weight of ordinary ice

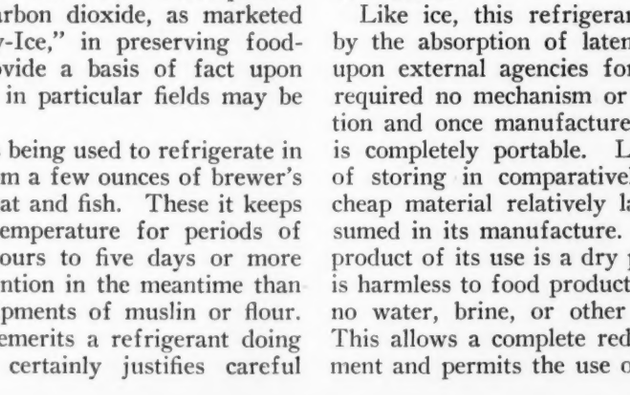
By D. H. KILLEFFER
Technical Director, Dry Ice Corporation of America
New York

REFRIGERATION occupies a place in food preservation too well understood and too widely applied to require discussion here but its latest phase, the use on a really commercial scale of solid carbon dioxide, is still new enough to have much mystery and no little mysticism surrounding it. So revolutionary have been the results of using this hitherto rare and curious material to solve industrial problems of portable refrigeration that imaginations have been fired to the point of making of it what decidedly it is not, a panacea for all ills of artificial cooling. Certainly the peculiar abilities of this extraordinarily cold and remarkably efficient material give one ample excuse for imagining almost anything. Our purpose here is to point out some of the things that have been accomplished through the use of solid carbon dioxide, as marketed under the trade mark "Dry-Ice," in preserving foodstuffs in transit and to provide a basis of fact upon which estimates of its value in particular fields may be made.

Already the new product is being used to refrigerate in transit shipments varying from a few ounces of brewer's yeast to carloads of fresh meat and fish. These it keeps at an even predetermined temperature for periods of time varying from a few hours to five days or more while requiring no more attention in the meantime than would be paid to similar shipments of muslin or flour. Whatever other merits or demerits a refrigerant doing such things may have, it certainly justifies careful scrutiny from industries confronted, as are the food industries, with refrigeration problems.

Solid carbon dioxide is merely the result of converting the fizz of soda water into a solid form by intense cold. Its temperature is almost unimaginably low, lower than any to be found in nature at either of the poles or between them. Depending upon circumstances, the actual temperature of the block of finished ice is not higher than 110 deg. below zero Fahrenheit and may be as low as —165 deg. F. Not only has it an extremely low temperature but its cooling capacity in passing from solid to gas at 32 deg. F. is approximately 280 B.t.u. per pound as compared with 144 B.t.u. per pound of water ice melting at the same temperature. In other words for mere cooling effect the value of solid CO_2 is just about double that of ice. If that were the whole story this discussion might very well stop here, but, surprising to relate, the proper design and construction of the refrigerated space to take advantage of its peculiarities allows materials to be maintained at low temperatures with the consumption of a single pound of the product to replace as much as ten to fifteen pounds of ice and in addition permits its use where ice, from its very nature, could not be seriously considered.

Like ice, this refrigerant releases its cooling effect by the absorption of latent heat and does not depend upon external agencies for its effectiveness. There is required no mechanism or power supply for its operation and once manufactured and put properly to use it is completely portable. Like ice also, it is a method of storing in comparatively small compass in a very cheap material relatively large amounts of power consumed in its manufacture. But unlike ice, the ultimate product of its use is a dry practically odorless gas which is harmless to food products surrounded by it. There is no water, brine, or other liquid to be drained away. This allows a complete redesign of refrigerating equipment and permits the use of paper and strawboard containers to replace heavier and more cumbersome waterproof boxes and tubs. Paper and board containers possess both the advantages of light weight for shipment and of low enough cost to put them in the one-trip class with a margin of saving below the cost of two-way shipment of heavier water ice packages.



The carbon dioxide is solidified by pressure

Naturally, an early question in connection with a novelty of this kind is that of relative cost as compared with existing, more or less competitive, materials

The present base price of the new refrigerant is approximately ten times that of ice. Unquestionably future large scale developments—present production is barely fifty tons per day—will lead to economies that may reduce this differential materially but even now in the field of portable refrigeration there are advantages of cost as well as convenience in its use because of the extremely high efficiencies possible through its use.

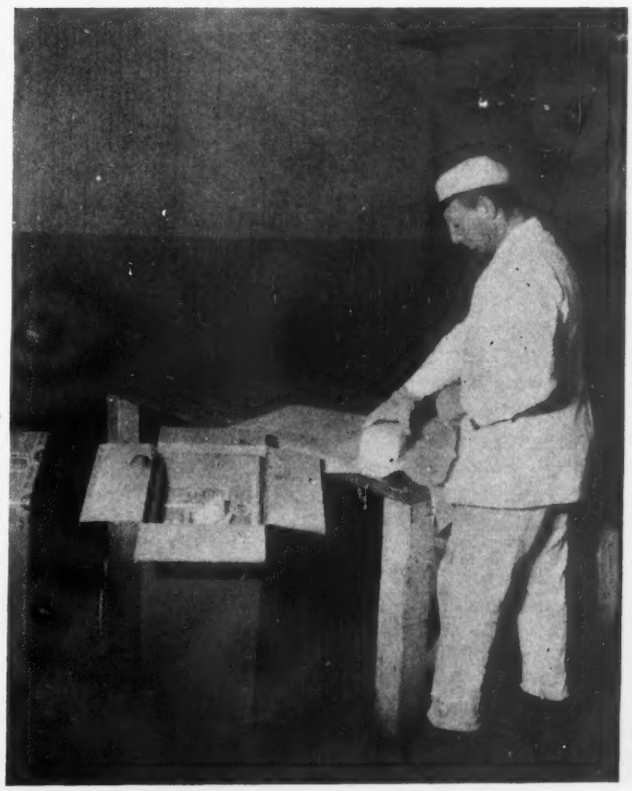
One of many uses is that of refrigerating trucks

If one considers only that solid CO_2, yielding twice as many B.t.u. for cooling purposes as does ice, costs ten times as much, one must immediately reach the conclusion that only in rare instances where there is some particular advantage in its favor can the former be actually and profitably competitive. This applies definitely to uses involving a lowering of temperature, the mere exchange of heat units between the material being cooled and the one doing the cooling, as distinct from a very large class of operations in which it is merely required to maintain a low temperature. The advantages on the side of this product which in some situations offset its higher cost are its extremely low temperature which permits cooling to 40 to 50 deg. below zero Fahrenheit with comparative ease, and provides a means of very rapid chilling to temperatures not so low; and the fact that it may be placed in direct contact even to the extent of actual mixing with most materials, insuring the highest possible heat transfer efficiency, without damage to them. The investment in refrigerating equipment for such uses becomes practically negligible, and this may be a decided advantage where large refrigerating capacity is required only at rare intervals and for comparatively short periods.

Successfully Used by Commercial Bakers to Remove Friction-Generated Heat

In kneading bread a noticeable amount of heat is generated and the common practice is to dissipate this heat by running cooling water through the jacket of the kneading machine. Although not accepted baking practice, recent experiments in which solid CO_2 broken into small pieces has been mixed directly with the dough in the kneader have made possible longer periods of kneading and more rapid kneading, both of which are advantageous and yield a bread of higher quality. The evaporation of the new product yields carbon dioxide which is in all respects similar to that generated in the dough by the yeast itself and there is no residue of moisture or any other undesired material to change the quality of the dough. The amount of solid CO_2 required for each batch in the kneader depends upon various factors involved but its use has been found to be highly economical.

In the field of low temperature maintenance it is proving highly economical. It provides a method of producing very low temperatures and of allowing careful control of this low temperature by control of its own rate of evaporation. By wrapping the block of the new product in more or less paper or other insulation, its rate of evaporation and hence the temperature of the cooled space can be controlled with the utmost accuracy at any point ordinarily required in commercial refrigeration practice. The fact that solid CO_2 yields a dry cold gas on evaporation makes it particularly valuable for uses of this class. The heaviness of cold carbon dioxide as compared either to the warm gas or to air provides an easy means of securing thermal circulation throughout an inclosed space and by applying this thermal circulation to a layer of gas just within the insulation, it is possible to place a wall of moving gas between the material refrigerated and the outside atmosphere. This wall of moving gas, whose temperature can be controlled by the rate of evaporation of the solid cake from which it comes, yields what might be called "dynamic insulation." It is capable of absorbing heat that leaks in through the insulation and venting it at the highest temperature of the refrigerated space. In this way the refrigerant itself is relieved of the task of absorbing all the heat leakage into the space cooled. This is a distinct advantage over ordinary ice whose effluent leaves the refrigerator at very nearly the temperature of the melting ice itself, preventing it from carrying away any



The new refrigerant should be well insulated

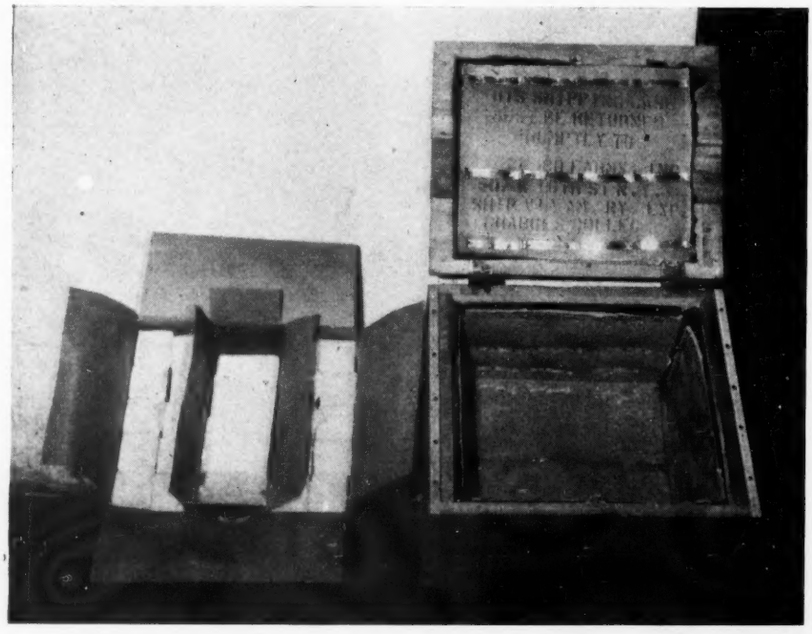
considerable amount of the heat leakage. In addition to this dynamic insulation, carbon dioxide gas possesses a very considerably lower heat conductivity than does air and hence the mere filling of a container with this gas instead of air increases the resistance to heat flow into it.

Circulation Effected by Specific Gravity

The fact that solid CO_2 yields by evaporation a dry gas inherently much heavier than air, is being applied effectively to the equalization of temperature in a compartment such as a freight car where the ratio of its length to its other dimensions is high. The weight of carbon dioxide induces a comparatively strong draught in a very short head and in this way the gas from the melting ice can be made to carry the cooling effect to remote parts of the refrigerated space. By introducing air or even warm carbon dioxide into the refrigerating compartment, the rate of evaporation of the ice blocks can be accelerated almost at will. The suction caused by the difference in head of the carbon dioxide air mixture in the duct systems induces a strong draught of air into the refrigerating chamber and, by controlling this with a suitable damper, an extremely uniform low temperature can be easily maintained through the space. Similarly, the generation of a positive pressure within the cooled space effectively reduces air leakage into it.

In transporting perishables, it has been found that the addition of carbon dioxide to the atmosphere of the car greatly impedes the growth of many of the micro-organisms which cause spoilage. Thus, it is actually possible in many cases to transport perishable materials safely in an atmosphere of carbon dioxide at a higher temperature than that required for their preservation in an atmosphere of ordinary air.

A package in a corrugated paper carton will maintain the temperature of such a material as cream cheese within a temperature range of 35 to 45 deg. F. without permitting the cheese to freeze or to become warm enough within 48 hours to be damaged in the least. Such a package as this containing ten pounds of cheese would require not more than four pounds of solid CO_2 properly insulated to maintain the conditions named for 48 hours, although the outside temperature might vary as much as 20 deg. in the interim. The design of such a package would prevent freezing of the cheese by carefully isolating the refrigerant from it and allowing only the gas resulting from its evaporation to surround the contents. The low specific heat of the gas would prevent freezing, its movement insulating the contents of the package by preventing access of heat.



Perishables, such as butter, reach their destination unaltered in texture and flavor

Both returnable and non-returnable shipping cases are used and motorcycle bodies and truck bodies are successfully refrigerated in this way. In practice it is not always possible to provide a complete jacket of cold gas around the material to be kept cold because of the mechanical difficulties of construction. On this account systems of ducts for directing the movement of the gas streams are installed in larger containers, such as truck bodies, railroad cars and large boxes. These ducts cover more or less of the surface of the space to be cooled and may or may not return part of the warm gas to the refrigerating compartment to be recooled and recirculated. In any case the excess gas is vented into the box and ultimately out to the air at the highest temperature of the space. The special advantage in the use of the new product in truck bodies and boxes for use on trucks is the dryness of the refrigerant itself which permits the use of lighter and more efficient insulation than could ordinarily be applied to boxes or bodies for use with ice. Also, in railroad cars it avoids brine drippage which is a cause of serious corrosion of steel structures and track, the annual bill for combating corrosion from this cause on a single railroad bridge amounting in one case to as much as $5,000 a year.

Early Proved Its Worth in Transporting Ice Cream and Other Perishables

The specific application of solid CO_2 to the ice cream industry has progressed further than its use in any other field. Small paper cartons holding as little as half a pint of ice cream may be insured against meltage by the addition of a few ounces of refrigerant. When the size of the ice cream packages is increased to a five-gallon can the amount of refrigerant required to keep this volume of material properly frozen in a paper carton is about eight to ten pounds per 24 hours. A package for containing a five-gallon can of ice cream for this length of time may have a tare weight of not more than three pounds in addition to the weight of the refrigerant required. For express shipments this is a decided difference from a tare weight of a returnable container together with the accompanying ice totaling approximately 120 pounds. Not only can ice cream be shipped in this manner over comparatively short distances but actual exports have been profitably made in large quantities from New York to Philadelphia to Cuba. Although this type of shipment partakes rather more of the nature of a stunt than a commercial venture, yet the fact that it is possible leads one to wonder whether the near future may not see ice cream ac-

tually shipped by freight in carload and in less than carload lots. In a similar way stunt shipments of ice cream in small quantities by mail have been made from New York to Oregon and a regular service is maintained by one New York ice cream manufacturer for mailing pints, quarts and more of his special ice creams to St. Louis, Chicago and even to New Orleans. The complete absence of any moisture to be drained away from the package permits the shipment of perishables by mail which could not otherwise be handled in this manner.

Refrigerating a shipping case for long-distance travel

Trucks for delivering ice cream both inter- and intracity have been successfully equipped with solid CO_2 systems. A consumption of as little as 35 to 40 pounds of refrigerant in a properly designed system will maintain 250 gallons of ice cream at a proper temperature for a period of 18 to 24 hours. A similar quantity of ice cream in a similar truck would require about 600 to 800 pounds of ice and salt to provide an equivalent length of carry. The development of this sort of delivery facilities in the ice cream industry has produced a demand for storage cabinets in which cans of ice cream can be held for dispensing purposes. Already such cabinets have been built whose consumption of refrigerant runs a little more than half a pound per gallon of ice cream stored per day.

For the solution of refrigerating problems involved in railroad transportation (both carload and less than carload), this new refrigerant thus offers three distinct advantages. It is quite independent of any external sources of power. It possesses an inherently high efficiency as a cooling medium. The distribution through a space of the cooling effect required by means of gas flow which is perfectly positive and can be regulated to be practically as rapid as desired, produces a uniformity of temperature not otherwise obtainable. Similar advantages appear in motor truck uses.

Shipment of candy during summer months is impractical over considerable distances unless provision is made for keeping it below a softening temperature. Tests of the new refrigerant for this purpose have been fully successful.

The carbon dioxide gas given off in the evaporation of solid CO_2 has a highly preservative effect on many food materials. Butter and eggs are especially benefited and retain their freshness longer in an atmosphere of carbon dioxide than they do in the air even at low temperatures. Fresh meat retains its "bloom" in carbon dioxide much longer than in air. Many fruits and vegetables, such as apples and potatoes, are similarly preserved by the presence of carbon dioxide in the atmosphere surrounding them.

Its Successful Manufacture Calls for Well Equipped Plants

A popular misconception has become widespread that solid CO_2 is manufactured in the container in which it is to be used and that it may be made anywhere and under practically any circumstances. This is decidedly not the case. Although carbon dioxide gas in an impure state belches forth from every smoke stack, its purification and liquefaction require a serious investment in plant equipment, and its solidification adds materially to this. Decidedly it is not the kind of operation one would choose to undertake over the kitchen range. The solidifying operation, in which the liquid is cooled by its own evaporation and converted to snow later to be compressed into blocks, is easily carried out if one has a supply of liquid. However, the efficiency of commercial practice in doing this is only to be realized in a properly equipped plant. It is also a fact that the market price of liquid carbon dioxide in cylinders — the raw material one would naturally use in a small scale operation—is decidedly higher than that of the commercial solid in blocks. Solid CO_2 can be readily shipped over comparatively long distances with losses easily compensated by its increased efficiency over other refrigerants. Consumers in Pittsburgh are being regularly supplied from a plant located in Chicago and the eastern states draw their supplies from New York.

A question often asked is "How long will 'Dry-Ice' last?" Of course that is as impossible to answer as the old question of the length of a string. If one exposes a 40-pound block of the product—the standard commercial unit—to the air of a large room at a temperature of about 75 deg. F., there will be some remaining at the end of 30 hours. In standard shipping boxes of a capacity of 320 pounds built with four inches of good insulation, the average evaporation is about seven per cent per 24 hours. More insulation will reduce the evaporation rate and less will allow it to increase.

To sum up this discussion, "Dry-Ice" is a concentrated, efficient, dry, portable refrigerant offering distinct advantages to the shipper of perishables. Not only is the weight of refrigerant required much less than with ice, thus saving both space and carriage charges, but its peculiarities allow it to be used in lighter weight containers of high efficiency. Its original use in the ice cream field is spreading rapidly to every field where portable refrigeration is required.

PASTEURIZING

With Regenerative Cooling

IN CHEESE MANUFACTURE

By Hubert Garrecht
Memphis, Tenn.

PASTEURIZATION has long been accepted as standard practice in the handling of city milk supplies because it makes milk safe. Most large cities have ordinances requiring pasteurization and specifying temperatures and holding periods that are designed to destroy all pathogenic organisms in the milk, thus preventing the spread of disease. That pasteurized milk resists souring and other undesirable changes is of minor importance although, of course, an advantage. For the same reasons, practically all present-day creamery butter and ice cream are made from pasteurized cream.

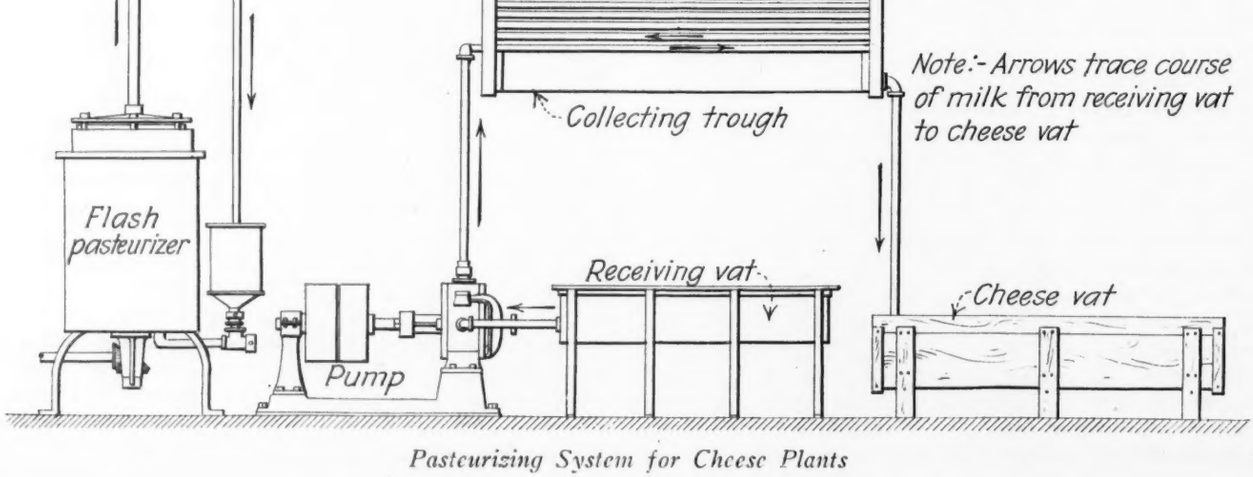
For several years cheesemakers have been turning their attention to pasteurization in connection with their product and although some of the larger cheese manufacturers have installed the necessary equipment, particularly in their Southern plants, the process is still not employed in the majority of plants. Primarily, pasteurization of milk used in cheesemaking destroys disease germs, but it is particularly desirable because it destroys other organisms which often give the cheesemaker considerable difficulty in making uniform, high quality cheese.

When making cheese from raw milk there is a natural and rapid development of lactic acid which, with the action of enzymes in commercial rennet extract, is depended upon to coagulate the casein, thus making a curd. Along with this desirable acid development, however, there is danger of rapid growth of certain undesirable organisms which, although evidence of contamination, are commonly present in milk. When this happens the quality of the cheese is impaired.

The Function of Bacteria in Cheddar Cheese Making

The most common and objectionable defect in cheddar or American cheese, and one that causes discrimination against it in the markets, is the presence of large numbers of smooth, round holes. These are caused by the development of gas in the finished cheese and the organisms responsible therefor can ordinarily be destroyed by pasteurizing the milk.

Proper pasteurization assures the cheesemaker that the common undesirable bacteria are not likely to develop. The desirable acid-forming organisms are also destroyed in great measure, however, and other means must be employed to secure this acid development. A culture of a clean, pure lactic acid-forming organism,



Pasteurizing System for Cheese Plants

commonly called a starter, is prepared. By adding the correct amount of this starter the acidity of the milk can be brought up to the proper point, and at the will of the cheesemaker. Destruction of organisms—good and bad, which happen to find their way into the milk—coupled with the addition of desirable organisms, give the cheesemaker complete control of the entire process and assure uniformly good results.

There are several reasons why pasteurization has not yet been more widely adopted by the cheese industry. There is always the natural desire to avoid the expense of additional and perhaps not absolutely essential equipment, particularly in the smaller plants. Slow processes which would add to an already long working day are not appropriate. An additional process, unless simple and economical of steam, water and power, would increase beyond its worth the cost of production. Finally, the development of equipment and a process for the special needs of the industry has been comparatively recent.

There are two generally recognized methods of pasteurizing. In one method relatively large amounts of milk are heated to a moderate temperature (145 deg. F.) and held at that temperature for 20 or 30 minutes before cooling. In the other, a thin stream of milk is heated to a higher temperature (160 to 180 deg. F.) and cooled immediately. Because it is continuous the latter is clearly the better method for the cheese plant. Milk is pasteurized as rapidly as it can be taken in with the result that within a few minutes after the last of the milk has been received the last vat is ready to be processed, just as when pasteurization is not employed. It has been found that in order to destoy pathogens and gas-formers heating to 160 deg. F., or even higher, is necessary.

Basically, the process consists simply of pumping the milk through a heater to bring the temperature up to 160 degrees, and then running it over a cooler, cooling only to about 85 degrees—the temperature of "setting" cheese. In practice and for reasons of economy and general adaptability the equipment and process are modified. The milk is received, weighed, and sampled in the regular way. However, instead of its being run directly into the cheese vats it is run by gravity into a sanitary receiving vat. This vat should be large enough to permit pasteurization to start when it is full, and milk will be received and added to it rapidly enough to prevent interruption of the process for lack of milk. Ordinarily, a 500-gallon vat is large enough.

Regenerative Cooling Effects Substantial Economies

Because cooling a large quantity of milk from 160 to 85 deg. F. in a short time would require very considerable quantities of cold water or brine, which are not always available, and because great economy can be effected thereby, a regenerative cooler is employed. With this device, advantage is taken of the exchange of heat from hot to cold milk. Under favorable conditions no cooling water is required, and it is estimated that the cost for steam is reduced approximately two-thirds.

The cold milk, as received, is pumped from the receiving vat to the lowest tube in the regenerative cooler, traveling upward through all the tubes. Emerging from the top tube, the milk is piped to a vertical, or "flash," pasteurizer which heats the milk to a predetermined temperature. Centrifugal force, generated by the rapidly revolving impeller, carries the hot milk to the distributing pipe on top of the regenerator and spreads it out into a thin film. While trickling down over the outer surface of the tubes through which the cold incoming milk is being pumped there is an exchange of heat, by virtue of which the hot milk is cooled and the cold milk is heated.

When the system is in operation the milk emerging from the regenerator has been heated to between 110 and 130 deg. F. by the heat removed from the hot milk, which in turn has been cooled to about 85 or 90 deg. F. Naturally, these temperatures depend upon the temperature of the milk when received. In summer, when milk brought to the cheese plant is often warmer than 70 deg. F. it is necessary to cool the pasteurized milk a few degrees lower than can be done by the milk alone. This is accomplished by adding a small cooler section through which cold water is circulated. This is placed below the regenerator in such fashion that the pasteurized milk may run down over it after leaving the regenerator.

The cooled, pasteurized milk is collected in a trough under the cooler and, if the cooler is set sufficiently high, runs by gravity to the cheese vats. Another pumping is required if the collecting trough is set lower than the top of the vats. The last milk through the system is followed by water, which rinses into the cheese vats all the milk and valuable milk solids left in the apparatus.

Other than the usual cleaning and sterilizing necessary when handling milk, no particular care or additional help is required to operate this pasteurizing equipment. If the vertical pasteurizer or heater is equipped with a temperature regulator of the type manufactured by several companies, the operator need never even adjust the steam valve, as these regulators automatically control the steam opening and thereby secure the proper temperature in the milk being processed. When the receiving vat is full, the process is put in operation by throwing the switches which start the pump and vertical pasteurizer. The equipment can be washed up while the milk in the last vat is "setting."

All cheese plants are interested in improving quality and in making a uniform grade of cheese that shall vary but little from day to day; matters of this sort determine the price paid for their product. Pasteurization of the milk used in cheese making is suggested as a practical means to that end.

Rice Can Now Be Tested For Its Vitamin B

The following paragraph, quoted from a recent issue of *Science,* is of great importance to rice millers as well as to the public:

"A simple test for determining rice that will prevent beriberi in human beings and polyneuritis in pigeons and other fowl has been developed by Dr. Edward B. Vedder, of the U. S. Army Medical Corps, stationed at Manila, and R. T. Feliciano, chemist of the Manila Bureau of Science. The rice grains are stained with an iodine solution, the starch granules taking on a blue color. The proportion of external layers, which remain unstained, and which contain the beriberi-preventing factor, may be determined with reasonable accuracy by simple inspection, report these investigators. This method is so quick that it may be used during the milling process to determine the degree of milling. A chemical index for beriberi-preventing rice was also determined."

Sterilizing in a Dry Vacuum

A New Method of Preserving Flavor and Quality

Staff Article

EVACUATION of foods in hermetically sealed containers as a means of protecting them from the possible direct effects of atmospheric oxygen in the air inclosed in the container is not a new procedure. It has been applied for several years to nuts, coffee, cocoanut, sweetened condensed milk, etc., some of which are dry packed products and depend for preservation upon the low moisture content or high osmotic pressures.

The use of vacuum in canning as a substitute for the steam exhaust box for the wet packing of hermetically sealed foods sterilized by heat is not a novelty although its commercial use is more recent. Perhaps the words "substitute for the steam exhaust box" are not as well adapted an explanation as should be used. The use of the vacuum exhaust gives an exceptionally efficient exhaust in those products where the time element is not a large factor. The method has been used commercially for several years on products such as tomatoes, grape fruit, ready cooked spaghetti, salmon, meats, etc., although up to date it has not found a general application in some of the fruits such as berries, pears, apples and similar products which require a long slow exhaust to remove air inclosed within the deeper tissues of the product being canned.

The commercial application of vacuum to dry packing of products to be sterilized by heat is, however, a recent development for which the food industries are indebted to the Research Department of The American Can Co. The method is the development of an idea of the Research Manager Dr. F. F. Fitzgerald, whose connection with the process is indicated by the recently trade marked name "Geralizing."

The practical interest in the development is shown by the large number of plants employing it commercially this year. The technical success of the method is assured; only the reaction of the consuming public remains to be tested out. Those who have been privileged to taste the products packed under the new process are enthusiastic in their praise.

The principal commercial trials conducted in 1928 the results of which have been made public, have been made on peas. The following is a brief summary of the method and its application to them.

By "Geralizing" peas the original quality of the vegetable seems to be maintained practically unchanged, perhaps more nearly *au naturel* than is possible by ordinary canning. Hence, when the quality of the raw product is what the canner knows as fancy, the finished "Geralized" peas possess a superior flavor and texture; but when the raw peas are of a lower quality than fancy and contain enough starch to be distinctly hard the "Geralized" product exhibits this quality to a greater degree than would be the case if the older method, with its long blanch, i.e. boiling in water, were employed.

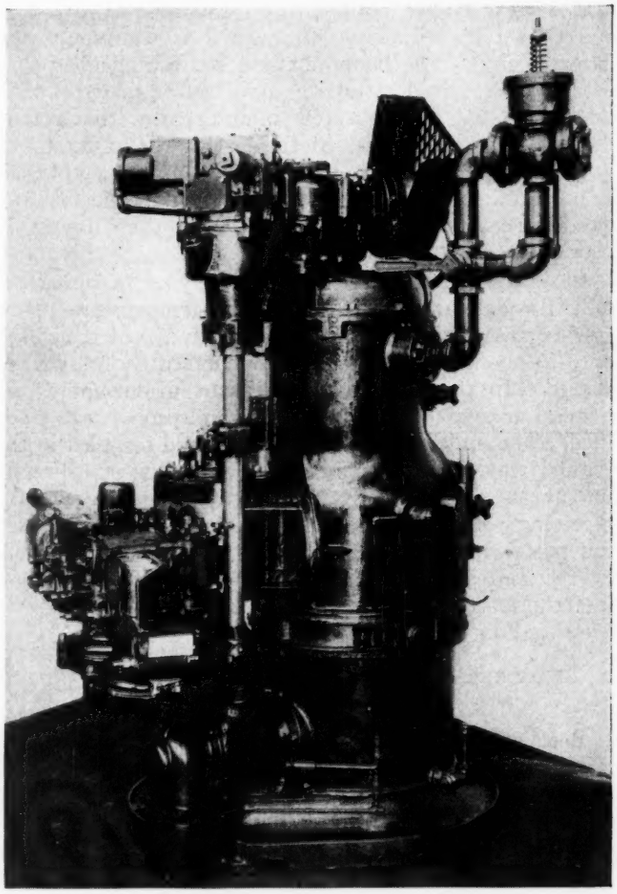
"Geralizing" removes very little substance from the peas—even less than is removed by ordinary canning. Thus the sweet flavor is undiluted by the liquor in the can and the peas seem to be actually sweeter than the raw peas. Similarly, any pre-existing starch in the peas is also undiluted and when seen or tasted seems to be more apparent than would be the case with the fresh vegetable cooked in the home kitchen; and all because nothing is taken away.

Keeping this fact in mind, it will be seen why "Geralizing" will become very important in its relation to fancy peas. There seems to be a greater preference for the "Geralizing" of sweet varieties of peas than for Alaskas.

The several operations of vining, cleaning and washing the peas are the normal factory procedure. Blanching, however, is optional, many preferring unblanched peas because more of the strong natural green pea flavor is retained without the immersion in boiling water. To salt the peas, for seasoning purposes only, they are dipped in perforated buckets into a 7½ per cent or 6½ per cent brine depending upon whether the peas are blanched or not. The brine dip is for five seconds only, followed by drainage and filling into cans.

The filling operation for undergoing the "Geralizing" process is capable of further and better mechanical development. This year the peas were poured into cans by hand but it is expected that special fillers will be available in 1929.

The cans employed in connection with this method



High-speed vacuum closing machine

are a special short No. 2 can which is the usual diameter for peas packed by the regular method, but is shorter than the regular size in order to give a stronger body to better withstand the crushing force of the atmosphere because the closure is made in a 29-inch vacuum.

It should be borne in mind that in wet packing, i.e., packing in which the interstices of the product are filled with liquid, the high exhaust has a tendency to draw

the ends of the can inward until there is virtually none, or at most, very little, "head space" left in the can. The liquid being incompressible thus supports the can against collapsing but in a "Geralized" product this support is lacking because the voids between particles of the product are empty space.

It is of interest to know that the cans are inside enameled with "C" enamel, which has the function of absorbing any hydrogen sulphide formed by the decomposition of proteins of the pea under the high temperature of sterilization. The hydrogen sulphide in an unenameled can may sometimes cause the formation of slightly purplish spots on the surface of the tin plate that are not as pleasing to the eye as the bright tin.

The filled cans containing nothing but peas pass successively through a clincher that loosely attaches the lid, a No. 1 automatic vacuum closing machine equipped with a no-vacuum - no-can feature and thence into a water bath, the latter step being a rather unusual one to be found at this point in canning operations. From the bath the cans are taken to the retorts to be sterilized. In the vacuum closing machine the air is exhausted from the cans through the space between the loosely fitting clinched lid and the can by the 29-in. vacuum and the lid is then rolled tightly in place. This operation is performed at the rate of about 100 cans per minute.

The purpose of the water bath is to afford a temporary seal of any microscopic holes which might possibly exist in the gasket of the can lid until the heat of the process has had opportunity to soften the gasket sufficiently to make the seal perfect.

Sterilizing conditions for "Geralized" products are, in general, much the same as for packing the foods in liquids. In some cases the heat penetration is more rapid and shorter times may be used; in other cases the heat penetration may be less rapid, due to matting of the product, and longer times must be used.

For "Geralized" peas in the special size can 22 minutes at 250 deg. F. was used with very rapid coming up and blowing down times. For those unfamiliar with the technical language of canning the first of the terms is explained as referring to the time required between turning steam into the retort and the attaining of its maximum temperature, while the second refers to the time elapsing between the shutting off of the steam and its reaching atmospheric pressure.

It will be noted that no liquid is added to the product in the can, yet in the case of "Geralized" peas the result is a retention of the original flavor of this succulent vegetable and an extremely pleasing sweetness.

The "Geralizing" process marks a step forward in food preservation technique toward the goal of preservation in a form more closely approximating the natural condition of the food at the time of harvest.

Are All B. T. U.'s Alike?

A Study of Coal for the User of Small Amounts of Steam

THE frequency with which "distress" coal may be picked up on the market at prices altogether inconsistent with quality has a tendency to make coal buying for the small steam plant a haphazard affair in which too much emphasis may be placed on price. To be able to purchase an occasional car of coal at $0.60 per ton f.o.b. mines when $1.60 may be a price more nearly in line with the normal figure is very liable to stimulate a buyer's belief in the possibility of continued economies of this nature by careful shopping around. This seems to be particularly true in the smaller plants where a single car of coal will last anywhere from five days to possibly three weeks.

There are many motorized food factories whose demand for process steam is extremely light, whose service frequently requires but a single horizontal return tubular boiler of 150 hp. In such a plant, coal from different sources may show rather widely variable fuel efficiencies should the boiler be set in what is often called the Hartford setting, which usually implies a distance between grates and boilers of only 28 inches and is a relic of the days when anthracite coal was quite generally available.

The older the plant the greater is the probability of the occurrence of low boiler settings which are decidedly out of line with the best practice of today, and when these out-of-date conditions are existent there is much greater need of intelligent coal purchases than would be the case where high settings prevail.

For the purpose of this discussion coal has three important constituents—fixed carbon, volatile matter, and ash. The fuel value is found in the first two constituents and as determined in the laboratory represents their *complete* combustion recorded in terms of B.t.u. per pound of coal. When the coal salesman reports that the Blank Testing Laboratory found a fuel value in his coal of 14,000 B.t.u. per pound he is telling the result of what occurred in a bomb calorimeter in a laboratory under perfect conditions of combustion, but the coal buyer should not permit himself to believe that all those 14,000 B.t.u. are available to him unless the conditions of combustion in his boiler furnace are equally perfect.

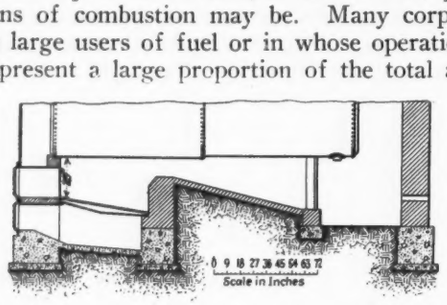
If the plant is very carefully operated and all coal weighed as it goes to the fireman it will be found at times that less of one coal may be used per unit of production than may be the case with another. Furthermore, it may be found that the amount of fuel per unit of production does not always run parallel with the reported fuel value. It may be found to vary in the opposite direction and, as this writer has found, some apparently very economical purchases may prove in practice to be uneconomical. The difference does not necessarily lie in the ash content but instead may be due to inherent qualities of the combustible part of the coal.

In purchasing coal one is buying B.t.u.'s in a potential form. Whether they may be utilized completely or not depends upon the combustion conditions and, with low boiler settings, the likelihood of obtaining even a reasonable percentage of the potential heating value of the fuel in some cases is remote. Several factors are involved, the most important under this condition being the question as to what part of the coal is furnishing the heat.

Volatile matter burns with a long flame and requires considerable space for its combustion. Anything that may chill the flame below its kindling point causes the flame to "go out," the unconsumed gases and soot constituting the customary cloud of smoke. Just as the placing of a cold object, such as glass, in a candle flame will cause it to become sooted, so also will burning volatile matter deposit soot if it meets any cold objects before its combustion is complete. It is quite true that

the boiler is hot but, compared with the 2,000 degrees of the flame temperature, its 300 to 350 degrees of temperature is relatively low. If the flame extinguishes and makes smoke there is a waste of potential heat.

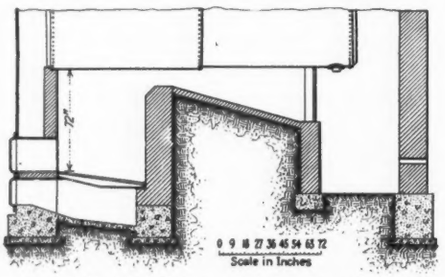
On the other hand fixed carbon, which is non-volatile, burns with practically no flame and there is virtually no waste of this part of the fuel, no matter how poor the conditions of combustion may be. Many corporations that are large users of fuel or in whose operations fuel costs represent a large proportion of the total are cognizant of these facts and are raising their boilers to permit a longer flame travel.



High volatile coals burn with much smoke under low boiler settings

New installations of large boilers, usually of types other than horizontal return tubular boilers, are now being made with enormous fire boxes. In extremely large boilers distances of over 20 feet between the fire and the nearest parts of the boiler are found, admittedly a very great contrast to the 28-inch height that still prevails in many plants. Obviously it would be most unwise for a plant using but small amounts of steam to go to an expense of possibly $2,000 per boiler to raise its boiler settings for the sake of better fuel economy alone—unless coal should become extremely high priced.

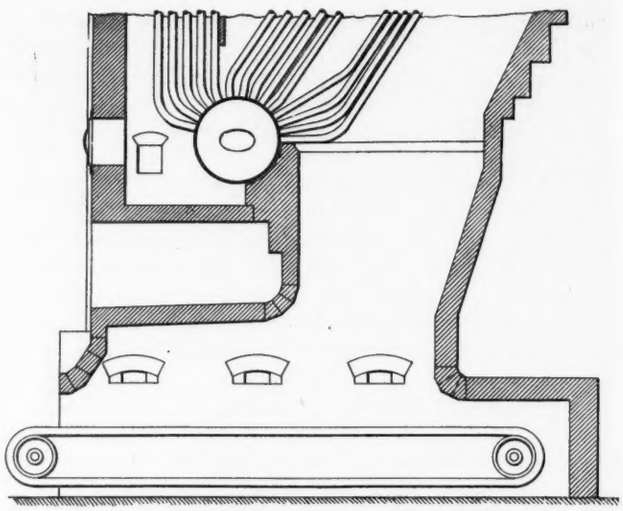
However, there are ways of making better use of coal in plants having low-set horizontal return tubular boilers.



Long flame travel in high boiler settings permits good combustion of both high and low volatile coals

Here possible economy lies in the purchase of the sort of coal that is best adapted to the conditions under which it is to be used. Preference should be given to coal having a relatively high percentage of fixed carbon with a correspondingly low volatile matter. This is because the B.t.u. purchased as fixed carbon are nearly all available to the user, whereas the B.t.u. purchased as volatile matter will be only incompletely available when burned under the imperfect conditions found in low settings.

There is a real difference between the availability of the B.t.u. from these two sources and it can be shown by carefully kept boiler room records. Certain high-volatile bituminous coals, such as are found in some of the mines of New Mexico, are nearly 50 per cent volatile matter and when burned under boilers having low settings will give off enormous clouds of smoke. In contrast to these are the low-volatile bituminous coals of the east, of which Pocahontas is an extreme type, having volatile matter of as low as 15 per cent. Pocahontas burns with practically no smoke because its fuel value lies chiefly in fixed carbon. Pocahontas, however, is a coking coal and presents firing problems of a sort that requires extremely good firing to make full use of its good fuel qualities.



Large boilers with mechanical stokers offer best combustion conditions. Note that this fire-box is drawn to the same scale as the others on this page

It is impossible to lay down a hard and fast rule governing the relative value of coals of different composition. The experience of one plant may not duplicate the experience of another. The sum of $50 for a set of wheelbarrow scales to be used for weighing coal and an insistence on accurate weights is a sufficient basis for building a statistical record for the study of the relative utility of coal from different mines. In a short time enough data will be available to gage the relative value of the fuels to the user and permit him to form an opinion as to the real worth of different tenders of coal.

Arrowroot Obtained Chiefly From Island of St. Vincent

Arrowroot, a form of starch, obtained from the root of a plant resembling the *Aspidistra,* is unsurpassed as the chief ingredient of custard and blanc mange, and in gravies, soups and pastries is considered superior to cheaper grades of starch.

One of the outstanding characteristics of arrowroot, as contrasted with other starches, is its high gloss or finish when made into fluid or semi-fluid products. Other starches seem to offer only dull surfaces to the wet products in which they are used. Although its use heretofore has largely been found in medicinals it has also found a slight use in food manufacture.

According to U. S. Commerce Reports for September 17, 1928 the exports from St. Vincent for the past three years has ranged from 2,950,000 to 3,292,000 pounds.

Imports into the United States for the past five years have been as follows:

1923	Pounds, 16,819
1924	Pounds, 14,646
1925	Pounds, 11,751
1926	Pounds, 23,743
1927	Pounds, 18,258

Prices have ranged from 4 to 11 cents per pound, according to quality.

Opportunities for Improvement In Manufacturing Technique

EDITOR'S NOTE: *Believing that the formulation of a problem is the first step toward its solution, the editors of "Food Industries" asked a number of authorities of food manufacture in the United States to outline some of the needs and problems of their particular branches of the industry. In response to this request Prof. W. V. Cruess of the University of California contributed the following comprehensive statement. We shall be glad to hear from others who may have appropriate suggestions to offer.*

I. Dried Fruit Industries:

A. Many of the evaporators and dehydraters now in use are of obsolete and inefficient design. There is need for replacement with more modern dehydraters

B. Many operators of dehydraters do not get maximum efficiency from their plants because they have not been instructed fully in the fundamental principles of dehydrater operation.

C. Several foreign countries that are normally heavy importers of dried fruits containing sulphur dioxide have recently placed a limit on the sulphur dioxide content of such fruits making it difficult and in most cases impossible to obtain a product of normally light color. There is need for revision of the regulation or improvement and modification of the drying process so that the sulphur dioxide content can be limited; probably dehydration to replace sun drying is the most hopeful way out. Good opportunities for co-operation of the fruit and the dehydrater industries on the problem.

D. Better control of insect infestation by better design and construction of storage bins and more general use of fumigation to destroy insects and eggs. Vacuum fumigation probably is to be recommended. There is also great need for a cheap insect-proof carton for dried fruits and for further co-operation between carton manufacturers and the dried fruit packing industry in the adaptation to factory practice of existing information on this all-important problem.

E. Most dried fruit packers do not attempt to control the moisture content of their dried fruits at the time of packing; they should analyze all batches before and after processing so that the moisture content can be maintained at or near the optimum for maximum quality.

F. There is need for a moisture-proof carton or other simple container to maintain the moisture of dried fruit at fairly constant level. It dries out in arid climates and takes up water and molds in humid climates. Closer co-operation of can makers and others with the dried fruit industry is needed.

G. Need for more general use of recording instruments on dehydraters and on dried fruit processers.

II. Fruit and Vegetable Canning Industries:

A. The first need of these industries is the application to commercial practice of the great wealth of new scientific knowledge gathered for these industries by the research laboratories of the United States Department of Agriculture, by the National Canners research laboratories, by the American Can Company research laboratories and by the various university canning research laboratories. If applied generally the new knowledge of botulism and destruction temperatures for *B. botulinus* would markedly revise the processing and temperature control and temperature recording instruments in the vegetable canning industry; particularly in states other than California. Canners could with profit study the many research publications on canning problems and apply the major recommendations to advantage. Some of the other problems on which much valuable information exists are exhaust and vacuum, non-bacterial spoilage, such as the darkening of certain products, and the formation of hydrogen swells; others are corrosion of tin containers, retorting practice, temperature control, bacterial spoilage, vitamins in canned foods, etc. There should be some technically trained man in every important canning organization to make use of the aforementioned existing information. The canning machinery industries and the temperature control and recording instrument companies could assist.

B. Scientific study of and application of engineering principles to the cannery waste disposal problem. Considerable progress already made; much more is to be made.

III. Vinegar Industry:

More efficient machinery; better plant control; more general use of pure yeast and other methods of controlling fermentation, both alcoholic and acetic. Better product to the consumer; too much low grade vinegar of poor flavor and appearance on the market.

IV. Fish Canning:

Waste disposal and utilization. Scientific study of the problem; design of equipment to handle product efficiently and profitably. Much being done at Monterey, California by two leading machinery companies in developing profit from fish wastes.

V. Beverage Industries:

A great opportunity to take advantage of increasing popularity of fruit beverages to replace synthetic beverages. Opportunity for equipment companies to start the ball rolling.

Prominent Trade Associations and Scientific Societies

American Association of Cereal Chemists
836 Omaha Grain Exchange, Omaha, Neb.
M. D. Mize, Secretary

American Association of Creamery Butter Manufacturers
Continental and Commercial Bank Building,
Chicago, Ill.
Geo. L. McKay, Secretary

American Bakers' Association
1135 Fullerton Avenue, Chicago, Ill.
Dr. L. A. Rumsey, Secretary

American Bottlers of Carbonated Beverages
726 Bond Building, Washington, D. C.
Junior Owens, Secretary

American Cider Vinegar Manufacturers' Association
841 Powers Building, Rochester, N. Y.
S. L. Crawford, Secretary

American Corn Millers' Federation
Victor Building, Kansas City, Mo.
Reynier Van Evera, Secretary

American Dairy Science Association
Ithaca, N. Y.
J. M. Sherman, Secretary

American Dry Milk Institute
160 N. LaSalle Street, Chicago, Ill.
H. E. Van Norman, President

American Grocery Specialty Manufacturers' Association
52 Park Place, New York, N. Y.
H. F. Thunhorst, General Secretary

American Honey Institute
410 Chamber of Commerce Building, Indianapolis, Ind.
H. E. Barnard, President

American Institute of Food Distribution
369 Lexington Avenue, New York, N. Y.
Gordon C. Corbaley, Director

American Macaroni Manufacturers' Association
25 Front Street, Brooklyn, N. Y.
Thomas H. Toomey, Secretary

American Oil Chemists Society
705 Tchoupitoulas Street, New Orleans, La.
J. C. P. Helm, Secretary

American Society of Bakery Engineers
1135 Fullerton Avenue, Chicago, Ill.
Victor E. Marx, Secretary

Associated Bakers of America
360 N. Michigan Avenue, Chicago, Ill.
John M. Hartley, Secretary

Associated Corn Products Manufacturers
208 South LaSalle Street, Chicago, Ill.
Jay Chapin, Secretary

Association of American Dairy, Food and Drug Officials
Lansing, Mich.
W. C. Geagley, Secretary

Association of Manufacturers of Confectionery and Chocolate
621 Broadway, New York, N. Y.

Association of Operative Millers
203 Postal Telegraph Building, Kansas City, Mo.

Association of Pacific Fisheries
810 Securities Building, Seattle, Wash.
Dr. Ernest D. Clark, Director

Biscuit and Cracker Manufacturers' Association of America
90 West Broadway, New York, N. Y.
R. T. Stokes, Secretary

Bureau of Raw Materials for American Vegetable Oils and Fats Industries
944 Munsey Building, Washington, D. C.
John B. Gordon, Secretary

Edible Gelatine Manufacturers' Research Society of America
1457 Broadway, New York, N. Y.
H. B. Sweatt, Secretary

Evaporated Milk Association
231 South LaSalle Street, Chicago, Ill.
Dr. Frank E. Rice, Secretary

Flavoring Extract Manufacturers' Association of the United States
Cincinnati, Ohio
R. E. Heekin, Secretary

Institute of American Meat Packers
506 South Wabash Avenue, Chicago, Ill.
W. W. Woods, Vice-President

Institute of Margarine Manufacturers
1049 Munsey Building, Washington, D. C.
J. S. Abbott, Secretary

International Association of Ice Cream Manufacturers
The Telegraph Building, Harrisburg, Pa.
Fred Rasmussen, Secretary

Millers' National Federation
Chicago, Ill.
A. P. Husband, Secretary

National Association of Chewing Gum Manufacturers
44 Spring Street, Newark, N. J.

National Association of Manufacturers of Fruit and Flavoring Syrups
1261 First National Bank Building, Chicago, Ill.
Thomas J. Hickey, Secretary

National Canners' Association
1739 H Street, N. W., Washington, D. C.
F. E. Gorrell, Secretary

National Coffee Roasters' Association
64 Water Street, New York, N. Y.
Felix Coste, Manager

National Confectioners' Association
111 West Washington Street, Chicago, Ill.
Walter C. Hughes, Secretary

National Kraut Packers' Association
Clyde, Ohio
Roy Irons, Secretary

National Live Stock and Meat Board
407 South Dearborn Street, Chicago, Ill.
R. C. Pollock, Managing Director

National Macaroni Manufacturers' Association
Braidwood, Ill.
M. J. Donna, Secretary

National Peanut Butter Manufacturers' Association
664 North Wells Street, Chicago, Ill.
H. J. King, Secretary

National Pickle Packers' Association
140 North Dearborn Street, Chicago, Ill.
C. J. Sutphen, Secretary

National Preservers and Fruit Products Association
1422 F Street, N. W., Washington, D. C.
D. R. Forbes, Secretary

National Sirup and Molasses Association
1416 F Street, N. W., Washington, D. C.

Oyster Growers' and Dealers' Association of North America
33A Fulton Street, New York, N. Y.
Eugene D. McCarthy, Secretary

Salt Producers Association
7310 Woodward Avenue, Detroit, Mich.
D. B. Doremus, Secretary

Society of Manufacturing Confectioners
208 South La Salle St., Chicago, Ill.
O. L. Moore, Secretary

Sugar Producers Conference
135 Front Street, New York, N. Y.
E. W. Mayo, Secretary

United States Beet Sugar Association
901 Union Trust Building, Washington, D. C.
Harry A. Austin, Secretary

United States Fisheries Association
33A Fulton Street, New York, N. Y.
Eugene D. McCarthy, Secretary

United States Sugar Association
83 Beaver Street, New York, N. Y.
M. Doran, Secretary

COST ACCOUNTING
Points the Way to Cleaner Competition

EDITOR'S NOTE: *Food manufacturers will derive advantages of several sorts—including pecuniary profit—from the use of a cost accounting system based upon adequate data periodically assembled. The following article, from the desk of a leading manufacturer of alimentary pastes, shows what has been done in the macaroni industry. By simple adaptation the present system is easily made appropriate for general use in the food industry.*

By GLENN G. HOSKINS
Vice-President in Charge of Production
The Foulds Milling Company, Libertyville, Illinois

MIX one hundred pounds of flour, thirty pounds of water, and a few ounces of salt. Knead into dough and press to the desired shape. Dry out the water that was introduced to make the mass plastic and macaroni results. Appears to be a simple process—but it isn't.

The origin of macaroni is lost in the Middle Ages, but its industrial development in America is comparatively recent. American opportunity, inventive genius, and the tendency to mass production has done its work here, as elsewhere, and the one-man plant that characterized the XIX century has attained truly magnificent proportions.

Semolina, made from durum, a hard, spring wheat, is generally conceded to be the best raw material for macaroni. High in protein and golden yellow in color, this type of milled product has a gluten that is tougher and more elastic than is the gluten of ordinary bread wheat. It is this quality that makes it possible for macaroni to be made in various shapes and still retain its form when cooked.

The manufacturing process is highly specialized. Mixing and kneading machinery is much heavier than that used in the baking industry. The presses used for forming the dough into macaroni are generally hydraulically operated and pressures up to 5,000 lb. per square inch are used. The drying process is the most difficult problem encountered. Contrary to general belief, macaroni is not baked; it is dried. Temperatures used in drying seldom go above 100 deg. F., but very close regulation of temperature is essential and humidity must be controlled minutely throughout the drying time.

Unfortunately the one-man attitude that formerly characterized the entire industry has survived in connection with costs and cost accounting. Keen competition coupled with over-production has steadily forced the selling price down. Ignorance of costs is causing price cutting beyond reason. The industry is under indictment because there apparently is no bottom to prices. Buyers are losing confidence in reputable firms who know their costs and consequently will not meet the unfair competition of those who do not. Therefore I welcome the opportunity to place before the readers of *Food Industries* some facts that I have recently gathered.

There are certain objectives at which we should aim in a discussion of this nature, such as, for example:

To secure for the industry a set of reliable average costs with which to compare individual costs;

To persuade those who do not keep an adequate cost system to install such a system;

To determine the effect on costs of volume production;

To measure the ability of the industry to absorb more volume without increase in capacity.

With that thought in mind, one hundred questionnaires were sent out to as many representative macaroni manufacturers. Twelve were returned and from them and from my knowledge of manufacturing, I have evolved the sets of figures that are the subject of this discussion. In my opinion, the approximation of these figures by any plant for an average of a year's production may be regarded as a sure indication that the plant in question is well managed and is operating efficiently according to present-day standards.

Table I is a balance sheet of flour purchased against goods sold. Note how production is divided. Such a division makes it easy to arrive at the cost of any item of a varied line. Broken goods are carried as goods in process until they are packed and ready for shipment. Therefore, on the inventory broken goods would carry the same price as bulk goods.

Table II is a cost statement. Expenses included under each item thereon are described in Table II-A. The flour loss actually averaged 6 per cent as given by the returned questionnaires, but I have used 4 per cent because I believe some of the returns included broken goods in the loss. I do not include broken goods in the loss because it is possible to get something more than cost of labor and materials out of broken goods. You will notice I have included in the loss the item unfit for human consumption. Some return can be realized from this item but it is so small that the best practice dictates charging it off as a loss and regarding anything received from it as so much velvet.

One return showed 99 lb. of finished goods out of 100 lb. of flour; another, 99½ lb. Without being unduly nor unfairly critical it is, of course, obvious that it is quite impossible to produce macaroni products that will

TABLE I—DEVELOPMENT OF COST FIGURES FOR A PLANT OPERATING EFFICIENTLY WITH AN ESTABLISHED VOLUME OF SALES AND DESIGNED TO PRODUCE ANNUALLY, 4,000,000 POUNDS, NET

Flour Statement (*In Pounds*)			
Flour on hand Jan. 1, 1927		80,000	
Flour purchased during year		4,120,000	
		4,200,000	
Less: Flour on hand Dec. 31, 1927		40,000	4,160,000
Sales for year		3,900,000	
Finished goods Dec. 31		300,000	
		4,200,000	
Less: Finished goods Jan. 1		200,000	4,000,000
Loss			160,000
Goods Produced (*In Pounds*)			
Bulk goods		1,920,000	
Broken goods		80,000	
N. M. M. A. goods		1,000,000	
Private brands		950,000	
In process 12/31/27 minus 1/1/27		50,000	
		4,000,000	
Unfit for human consumption		40,000	
Moisture loss		120,000	
Total		4,160,000	
Shipments or Sales			
Bulk goods, lb.	1,900,000 @	$0.08100	$153,900
Broken goods, lb.	50,000 @	.05500	2,750
N. M. M. A. goods, lb.	1,050,000 @	.09282	97,461
Private brands, lb.	900,000 @	.09717	87,453
Totals, lb.	3,900,000		$341,564

Goods in process are included under Finished goods.

keep and have only a 1 per cent loss between the incoming flour and the outgoing goods. Fifty-six cars of semolina analyzed by the American Institute of Baking by the approved Government vacuum method over a period of three months last winter averaged 14.43 per cent moisture. The Government requires that macaroni products must not contain more than 13 per cent moisture when shipped. Here is a loss of practically 1½ per cent in itself. Furthermore, no plant can be run without some loss from goods damaged by oil or dropped on the floor in the process of manufacturing.

Packing room overhead is made a separate item, because in order to allot it properly to the varied lines, it must be based upon actual goods packed. Production is figured on the basis of flour transformed into salable goods. Variation of goods in process makes goods packed different from goods produced. Shipping costs are based on actual goods shipped which does not necessarily correspond with goods produced. Over the year shipments will approximately equal goods produced but when monthly statements are made they will vary widely. If all goods are shipped prepaid, freight out may be made an item in general costs, but freight is such an important item in our costs today that goods should be sold on an FOB plant basis or freight allowed as a deduction from the invoice. Perhaps then many of us would stay in our own back yard.

Bulk and broken are considered as one item, because the packing characteristics are identical. One of the things that could be done to bolster up prices all along the line and which would not react to the disadvantage of anyone would be to make available technical data that would tend to cut down broken produced. Millions of pounds of broken are sold every year at nearly the cost of flour and each pound so sold takes the place of bulk goods on which a profit might be made.

Selling and advertising expense is approximated at 5 per cent of the selling cost. Many returns showed a lower cost than this and many a much higher selling cost. So much depends on the policy of the company that no general figure can be accurate, but in view of the fact that 5 per cent brokerage is not uncommon when goods are sold through brokers, it seems to me that this figure ought to be about right for all lines except widely advertised brands. It is no doubt too high for a straight line of bulk goods, but hoping that it might fall on fertile ground I will just drop the seed of thought that it is better to spend 5c. a case on increased sales effort to get 6c. a case more for the goods and maintain a price on which a profit can be realized, than it is to let the buyer dictate the price at all times.

Selling prices are calculated at cost, including advertising and selling, plus 10 per cent. The net profit, as shown in Table III, is 8.7 per cent on sales. An investment of $300,000 is required to make 4,000,000 lb. a year and this profit represents 9.91 per cent return on the investment. Neither interest on borrowed money nor interest on capital invested has been included in costs because, for this purpose, I have assumed that the company is operating on its own capital and dividends should come out of profit.

A return of 9.91 per cent on investment is not high.

TABLE II—COST STATEMENT BASED UPON A PRODUCTION OF 4,000,000 POUNDS, NET

Flour	$166,400	$0.04160
Repairs	3,400	.00085
Factory labor	27,760	.00694
Power expenses	9,120	.00228
Sundries	4,000	.00100
Insurance	1,960	.00049
Depreciation	8,320	.00208
Taxes	1,360	.00034
Bad debts	1,480	.00037
Executive salaries and expenses	10,480	.00262
Office salaries and expenses	5,040	.00126
Discount	3,800	.00095
General expense	2,440	.00061
	$245,560	$0.06139
Packing Room Overhead		
Production, 3,950,000 lb.	3,160	.00080
Shipments, 3,900,000 lb.		
Shipping labor	2,340	.00060
Total general costs		$0.06279
Bulk and broken, 2,000,000 lb.		
General costs		$0.06279
Packing supplies	$10,000	.00500
Packing labor	3,000	.00150
Bulk cost (total)		$0.06929
N. M. M. A. Goods, 1,000,000 lb.		
General costs		.06279
Packing supplies	14,540	.01454
Packing labor	2,700	.00270
N. M. M. A. cost (total)		$0.08003
Private Brands, 950,000 lb.		
General costs		.06279
Packing supplies	17,290	.01820
Packing labor	2,850	.00300
Private brand cost (total)		$0.08399
Selling and advertising expense	16,965	.00435

TABLE II-A—DESCRIPTION OF TERMS USED IN COST STATEMENT

Flour: Cost of flour piled in plant storage, including sack charge.
Repairs: All repairs to plant and machinery.
Factory labor: All labor handling goods from flour storage to packing department, including janitors and plant superintendence.
Power expenses: Purchased electric power, waste, packing, oil, coal and power plant labor, including firemen and watchmen and plant maintenance not charged to repairs.
Sundries: Miscellaneous manufacturing expense, including all general factory supplies, laboratory labor and expenses, glue, and other items not otherwise charged.
Insurance: Total insurance on building and supplies.
Depreciation: Depreciation on plant and machinery.
Taxes: All taxes except federal income tax.
Bad debts: Either a fixed sum per month to be adjusted at end of year or actual loss over period covered.
Executive salaries and expenses: Salaries and traveling expense.
Office salaries and expenses: Office help and supplies.
Discount: Discount for prompt payment on sales, less discount for prompt payment on purchases.
General expense: All other expenses not included under sundries or office expense; takes in such things as association dues, magazine subscriptions and charity.
Shipping: Labor handling goods from packing room to car, or from packing room to truck if goods are trucked.
Packing room overhead: Includes salaries of packing room foreman, stock clerk, sealing machine supervisor, and all labor unloading cartons and containers and general items not directly chargeable to any certain line of goods packed.
Packing supplies: Cartons, containers, wax paper, labels, and all other articles used in packing the goods.
Packing labor: Packing labor required for a specific line of goods.
Selling and advertising expense: Salesmen's salaries and expense, sales office salaries and expense, advertising, advertising supplies, salesmen's automobile depreciation and expense, samples, etc.

I have not made allowance for returned goods which should be deducted from sales. Our prices can not be changed readily with the fluctuations in the raw material market and it fluctuates enough every year to make a very substantial difference in profit, depending upon whether we have bought right or wrong. If everybody bought for immediate needs prices could change with the market, but the fellow who covered at the season's low dictates the price at which all the rest of us have to sell.

TABLE IV—PLANT PRODUCTION PER MONTH EXPRESSED IN PER CENT OF YEARLY PRODUCTION

Plant No.	26	100	54	94	56	35	24	58
January	8.78	9.3	7.7	10.42	8.9	9.14	9.12	6.24
February	6.52	4.5	7.5	10.51	7.5	9.02	7.21	8.48
March	10.75	8.9	8.9	4.82	8.4	8.16	5.58	7.05
April	10.15	5.3	7.2	7.75	6.9	6.10	5.31	7.02
May	8.75	7.1	7.8	4.78	7.5	6.36	6.35	7.26
June	9.85	7.5	8.4	6.40	6.6	6.00	5.46	8.02
July	3.29	5.7	8.1	9.05	7.9	5.95	6.50	6.54
August	9.79	10.1	7.9	8.65	8.4	10.67	8.83	8.45
September	7.73	9.0	8.8	7.85	8.3	10.54	8.71	9.00
October	10.17	11.9	9.2	10.42	9.3	11.09	8.95	11.90
November	8.84	9.6	9.8	9.45	8.9	8.76	9.17	10.97
December	5.27	11.1	8.5	10.50	10.1	8.21	8.88	9.07
M. P.	46	80	90	84.5	87.5	89	100	90
F. G.	85	97	98	92	99	93	94	95.5

M. P.—Percentage of plant capacity used during month of highest production.
F. G.—Finished goods obtained from 100 lb. of flour.

Average Monthly Production

	Per Cent		Per Cent		Per Cent
January	8.7	May	6.98	September	8.74
February	7.65	June	7.27	October	10.36
March	7.82	July	6.63	November	9.43
April	6.96	August	9.09	December	8.95

M. P., 83.3 per cent. F. G., 94 lb.

To those who may say that these costs are too high and that macaroni can and is made cheaper I would say, "Congratulations on your management." At the same time it would not be out of place to see just exactly where you save the money. Take your plant operations for last year and spend the time to figure them out along the lines of Tables I, II, and III. You might be surprised. The cry of manufacturers today is volume production. It is a worthy objective. Increase in volume up to a certain point will unquestionably cut costs. But, the methods of getting volume should be carefully considered.

Table IV shows the variations in volume by months for eight plants. The cost statement is based on a whole year, but we have figures taken from the questionnaires that show comparative costs for low production, high production and average production. Table V shows this variation. An average of the yearly costs without freight or packing supplies for these eight plants is $0.02768. Our statement shows $0.02554. Therefore, it is safe to set up our figures as a guide for good performance. Months of highest production average $0.02434, lowest production $0.03552. The plants average about 80 per cent capacity at the peak month and do 10.35 per cent of the year's business in October, and only 6.63 per cent in July.

Assuming that these figures represent the industry and that 400,000,000 lb. of macaroni is produced yearly, we could produce 10,250,000 lb. more in October and based on that maximum monthly production of 51,750,000 lb. could produce 321,000,000 lb. more in a year, a total of 721,000,000 lb., without new plants or added equipment. Now, we all know that full capacity all the time is a dream that never can be realized. But as we approach capacity we lower our costs from an average of $0.02768 to $0.02434 or $0.00334 per pound, or a saving of two and one-half million dollars per annum.

I am trying to prove that lots more can be obtained from cost figures than profit or loss per pound. A thorough knowledge of costs must be the foundation for every move made. Assume you decide you need a volume of increase of 1,000,000 lb. per year. If you know your costs you can decide whether you want to do it on price, and if you don't want to do it on price how much you can spend for advertising to get it. For example, a plant producing 4,000,000 lb. yearly at $0.02768 per pound can produce 5,000,000 lb. at $0.02434, a saving of $0.00334 per pound or about $16,700 yearly. A price cut of a third of a cent would not get the business because there is no bottom in the macaroni industry, but a little expenditure of brain matter plus a couple of extra salesmen and a little advertising might increase consumption enough to do it. The point is that knowledge of costs is at the bottom of all moves.

In conclusion I want to stress certain things.

1. Bulk goods can not be sold at less than 3c. a pound above the cost of flour without a loss and to make such a price the customer will have to come and get it. No freight can be paid and no selling expense allowed. The sales price should be 4c. above the cost of flour FOB factory.

2. The cheapest package goods cost 4c. a pound above cost of flour without freight out or selling expense, and the minimum price on the cheapest kind of carton packed 24 8-ounce cartons to a case, should be, based on 3½c. semolina, better than $1.05 per case FOB plant. Now, don't misunderstand these statements. I do not recommend selling as low as this, but am making the statement that no firm can sell cheaper than that and stay in business.

TABLE V—COST PER POUND OF MACARONI PRODUCED, EXCLUSIVE OF FLOUR, FREIGHT OUT AND PACKING SUPPLIES

Plant No.	A	B	C	Terms, Per Cent	F.o.b.	Bulk, Per Cent	Package, Per Cent
94	$0.01948	$0.03810	$0.02500	..	Plant	100	..
54	.02787	.03304	.03159	1	Cust.	76	24
9	.....	.....	.024125	1	.....	...	..
100	.....	.....	.02480	1	Plant	100	..
59	.....	.....	.02880	1	Plant	92	8
61	.02832	.04409	.02999	2	Cust.	1	99
35	.01927	.02619	.02250	2	Cust.	15	85
24	.03340	.04320	.03730	2	Cust.	33	67
58	.01773	.02854	.02509	2	Plant	60	40
Average	$0.02434	$0.03552	$0.02768			59	41

A—Cost for month of maximum production.
B—Cost for month of minimum production.
C—Average costs.

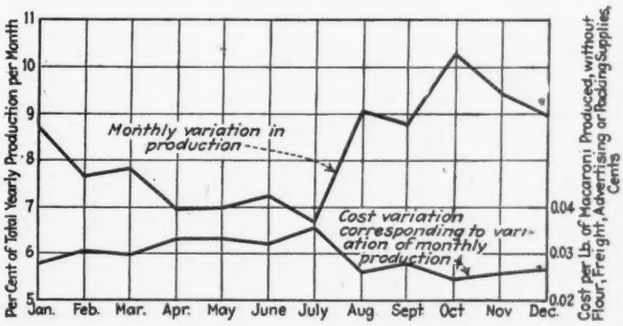


Table V in graphic form emphasizes the interesting and informative relationship between increased production and its cost

3. Volume production will cut costs but volume is not to be had by cutting the sales price. There is always somebody who will sell cheaper so that in the long run you get nowhere. Spend your extra cash stimulating general demand rather than taking your competitor's market by price cutting.

ABSTRACTS · OF · CURRENT · LITERATURE

DIASTASE IN CEREALS. Staiger. *Chemiker-Zeitung,* Aug. 29, pp. 679-80. It has been shown that malting is not necessarily an essential step in the saccharification of cereal starches; both wheat and rye have a sufficiently high natural diastase content to provide adequate saccharification without the aid of malt. It is not even necessary that the grains be sprouted first. This of course does not apply to grains in which the enzyme content has been weakened, as by any plant disease or by water damage or by excessive heat in drying. When the cereals saccharified in this way are fermented, the resulting spirit is low in fusel oil content. The new process also makes possible a considerable saving in labor and fuel costs.

* * *

SALTED ALMONDS. W. V. Cruess. *Fruit Products Journal,* 1928, No. 5, p. 29; *Experiment Station Record,* July, p. 91. A new method of commercial preparation of salted almonds, by which the oil cooking process is eliminated, is described. The blanched nuts are salted, dried at about 180 deg. F., and then heated for about 10 minutes at 400 deg. F. Keeping quality is improved, with no loss in flavor, as compared with the oil cooked product.

* * *

SATURATION IN FATS. H. P. Kaufmann. *Zeitschrift für angewandte Chemie,* Sept. 15, pp. 1046-8. The thiocyanate number of fats has been used in conjunction with the iodine number to estimate the saturated portion of the fat when, on account of the presence of mixed fatty acids, some reacting with more than two atoms of I, the iodine number was not a sufficient criterion of the content of saturated acids. It is now shown that the thiocyanate number can be used alone for this purpose, without the aid of the iodine number. This is due to the fact that thiocyanate reacts with only one double bond even in such fatty acids as linolic which have two double bonds. Hence the thiocyanate number, for example, of oleic and linolic acids are almost identical and there is very little error in estimating the saturated portion by difference. Where a fairly reliable average between the acids with one and with two double bonds can be estimated, even this small error is nearly eliminated. Hence the use of the thiocyanate number has an important time saving value, for instance in evaluating fats for hardening by hydrogenation, for candle making and the like.

* * *

COCONUT FAT. G. Collin and T. P. Hilditch. *Journal of the Society of Chemical Industry,* Sept. 21, pp. 261-9T. A study of the component glycerides of coconut and palm kernel fats, by the permanganate-acetone oxidation method. These fats resemble vegetable seed fats in general in that there is a rather even distribution of the fatty acid-glycerol combinations, so that the fat is a conglomerate of many individual glycerides.

* * *

DEHYDRATING PEACHES. Report of the Georgia Agr. Expt. for 1927, p. 27; *Experiment Station Record,* August, p. 290. It has been found in experiments at the Georgia Station that pulped cull peaches yield a satisfactory dried peach product when dehydrated in thin layers at 140 deg. F.

* * *

FRUIT BEVERAGES. J. H. Irish. California Agr. Expt. Station *Circular No. 313,* 1928; *Experiment Station Record,* October, p. 488. Practical directions are given for making fruit juices and the beverages derived therefrom. Items of equipment needed in such manufacture are described and illustrated. Special directions are given for making juices, sirups, concentrates and carbonated drinks from grapes, apples, loganberries, pomegranates and the citrus fruits.

* * *

PASTEURIZING SIRUPS. J. H. Irish, M. A. Joslyn and J. W. Parcell. *Hilgardia,* Publication of the University of California Agr. Expt. Station, vol. 3, No. 7, pp. 183-206; *Experiment Station Record,* October, p. 488. A report, with quantitative data, on heat penetration as a factor in the pasteurization of fruit sirups and concentrates in glass. Rate of heat penetration is influenced by the size, shape, wall thickness and thermal conductivity of the glass container and by the viscosity of the sirup and the rate at which the viscosity changes with temperature. In the light of these considerations, precautions against breakage are discussed.

* * *

PACKING HOUSE FUME PRECIPITATION. *Apparatebau,* Sept. 7, pp. 205-6. Removal of mists and fumes formed in packing house operations is a troublesome problem. Roof ducts, fans, ventilators and the like give only partial relief, being effective chiefly in summer. A newly designed installation, comprising an air preheater, an electrically driven low pressure ventilator and suitable hot air distribution lines, has been successfully applied to the problem of clearing the atmosphere in packing houses. No special heating equipment is necessary for the rooms to be cleared. The thickest fog can be cleared from a large room in 10 or 15 minutes. A diagram of the installation is shown.

* * *

HYDROGENATION. A. D. Luttringer. *Matières Grasses,* July 15, pp. 8227-8; Sept. 15, pp. 8281-3. A review of the literature of recent advances in the chemistry and technology of the hydrogenation of oils. These include hardening of cottonseed oil; the work of Williams on ethyl esters of fatty acids in hydrogenation; Pelly's study of hydrogenation of mixtures of fatty acids with neutral oils, and like contributions.

* * *

SALT BY EVAPORATION. A. Mittenberg. *Ukrainski Khemichni Zhurnal* (Technical Part), 1928, No. 2, pp. 43-64. A study of the thermochemical relations involved in the recovery of salt from brines; the heat balance in evaporation and crystallization; the heat capacity of pure water and of brines of different strengths; vacuum evaporation; temperatures and calorimetric data of the process; the Sankey apparatus and its use. Illustrated with tables, diagrams and a flow sheet.

* * *

HOT WATER HEAT. Egon Böhm. *Chemische Apparatur,* Sept. 10, pp. 193-5. Heating by super-heated water, as introduced by Perkins and Frederking about 30 years ago, made little progress at first. This was largely because the necessary safe high pressure equipment and technique were not then readily available. These difficulties have now been largely overcome, and successful applications of high pressure hot water heat are being made in the refining and processing of fats. Such an installation, comprising a still, hot water furnace and necessary piping, heat regulator, air valve, manometer, recording instrument, pressure regulator, cooler and thermometer, is described and illustrated as used in distilling fatty acids.

* * *

DIFFUSION BATTERY. E. Lehne. *Apparatebau,* Aug. 24, pp. 193-5. In the diffusion battery designed by Lehne, the juice can pass through the diffusion easily and without hindrance even when the slicing is poor, and the entire effluent from the diffusion and the slicers can be collected without any pretreatment. In the new design some of the difficulties of other diffusers are surmounted. Thus, clogging of the sieves is prevented by a rotary scraper on the bottom sieve and by streams of water in the sieves in the upper cone of the diffusers. A rotary pump on each diffuser in the battery provides for effective circulation of the juice. The capacity per diffuser is about 175 cwt. of fresh beet slices. The installation cost is less than for other types and the space requirement is not large. Illustrated with diagrams.

* * *

MODERN REFRIGERATION. George Hilger. *Refrigerating Engineering,* October, pp. 99-109. The three-pressure refrigerating system, and the improvements which have been contributed to the system in recent years are described. Temperature, pressure and quality of the refrigerant in the evaporator are

important. The three-pressure system improves the sensitivity and direct action of evaporator control, and prevents any evaporator from becoming a condenser. It is applicable either to constant or variable pressure evaporators. With the aid of temperature difference control valves it improves evaporator efficiency. Diagrams of flash gas valves, temperature difference control and other devices used in the system, and applications of the system, are shown.

* * *

FUEL FOR BAKERIES. *Industrial Gas,* September, p. 20. Bakeries in the Buffalo district, with technical aid from the local gas company, have successfully converted many of their ovens and boilers from coal or coke firing to gas firing. Even the heavy brick flue ovens (Kasicky type), generally thought to be unsuited for gas heat, now give excellent results. Some installation features are described, and results are illustrated by operating data.

SUGAR REFINERY EFFLUENTS. O. Spengler. *Sugar,* September, p. 412-3. There are two methods for disposing of the most troublesome refinery effluents in sugar manufacture. They are by double fermentation, and by fermentation-putrefaction, both being applicable to pulp press and diffusion waste waters. For double fermentation, the effluent is de-pulped and passes to a settling pond for the first fermentation. It is then nearly (80 to 90 per cent) neutralized with lime and allowed to ferment a second time. Butyric and lactic fermentations occur. This is the preferred process for refineries having pond facilities. The final effluent can be discharged into a large river; or into a small river provided an irrigation process precedes the discharge. The fermentation-putrefaction process gives a final effluent which may be discharged without objection even into small streams. Conditions essential to successful treatment by the two methods are stated, with operating data.

· GOVERNMENT · PUBLICATIONS ·

Documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington, D. C. Send cash or money order; stamps and personal checks not accepted. When no price is indicated pamphlet is free and should be ordered from bureau responsible for its issue.

Specification for Industrial Thermometers. U. S. Government Master Specification, issued by the Federal Specifications Board of the Bureau of Standards, as Specification No. 472a. Includes requirements which are mandatory for use of government departments in purchasing thermometers, and very suggestive of suitable specifications for industrial purchasers of this class of equipment.

Specification for Sugar. U. S. Government Master Specification, issued by the Federal Specifications Board of the Bureau of Standards, as Specification No. 579b. Includes requirements for two grades; Type A, pure fine granulated of not less than 99.5 per cent sucrose. Type B, pure powdered confectioners' XXXX, with or without edible starch, not to exceed 3 per cent. Inspection, when required, to be by methods of Assoc. Offic. Agri. Chem.

Specification for Syrup. U. S. Government Master Specification, issued by the Federal Specifications Board of the Bureau of Standards, as Specification No. 315b. Includes requirements for four types of syrups—A, cane sugar; B, blended corn and refiner's; C, maple and cane; D, maple.

Beet Sugar Statistics. Mimeographed statement from the Bureau of the Census giving statistics on beet sugar reported to the Census of Manufactures for the calendar year 1927.

Trade in Fresh and Frozen Fishery Products and Related Marketing Considerations in Atlanta, Georgia, by R. H. Fiedler. Bureau of Fisheries Document 1039. 5 cents. A detailed market survey of this area showing receipts, sources of supply, distribution, and describing the local trade practices.

Trade in Fresh and Frozen Package Fish Products, by R. H. Fiedler. Bureau of Fisheries Economic Circular 63. A general discussion supplementing trade surveys for certain local areas.

Car-Lot Shipments and Unloads of Important Fruits and Vegetables, for the Calendar Years 1924-1926. Department of Agriculture Statistical Bulletin 23. 25 cents. A significant economic summary showing the changing food habits of the country, especially with reference to off-season use of perishable products formerly considered luxuries. Largely statistical in nature.

Mysterious Barn Fires—Some Observations on Spontaneous Ignition of Hay, by David J. Price. Paper presented at the Annual Convention of the National Association of Mutual Insurance Companies, Milwaukee, Wisconsin, October 2, 1928. Mimeographed paper available from Bureau of Chemistry and Soils, Department of Agriculture. Significant also with reference to fire hazard during storage of other agricultural materials which may be subject to spontaneous combustion after wetting.

Co-operative Marketing. Report of the Federal Trade Commission to the Senate. Senate Document 95. This volume reports an elaborate economic and trade survey made in response to a resolution of the United States Senate and gives the results of a study of comparative costs, prices, and marketing practices as between co-operative and other marketing agencies handling farm products. Among the commodities considered are milk and milk products, grain, fruit, live stock, wool, poultry and eggs, cotton, tobacco, rice, nuts, vegetables, and other miscellaneous commodities.

The Treatment of Sewage by Stream-Flow Aeration, by H. N. Jenks and Max Levine. An article published in Public Health Reports of the U. S. Public Health Service, in the issue of September 28, 1928. A report of the investigation at the Engineering Experiment Station, Iowa State College, which resulted in the erection of a waste-disposal plant by Jacob E. Decker and Sons, Mason City, Iowa, for handling packing-house wastes.

Appendix 6 to Packers and Stockyards Act, 1921, indicating the abolishment of the Packers and Stock Yards Administration and the transfer of its duties to the Chief of the Bureau of Animal Industry, Department of Agriculture, forms the latest supplement to *Circular 156* of the Office of the Secretary of the Department, which gives general rules and regulations of the Secretary of Agriculture with respect to stockyard owners, market agencies, and dealers. The revision of January 1, 1925 of that circular is complete through Appendix 4. It therefore requires this new Appendix 6 and Appendix 5, which is Public Act 180 of the 69th Congress, revising Section 304 of the Stockyards Act.

Chemists Discuss Syrup and Swiss Cheese

In addition to the papers presented before the Food Symposium of the fall meeting of the American Chemical Society, held at Swampscott, Mass., and reported in October *Food Industries,* there were two scientific papers presented before other sessions of the society that are of interest to manufacturers of foods.

"A Comparative Study of the Effect of Two Starters upon the Chemical and Physical Changes Occurring in the Ripening of Swiss Cheese by Watson, Matherson and Sanders and presented by Paul O. Watson showed that the starter of lower initial acid content produced a cheese of better texture than that produced by a high acid starter.

In the division of Sugar Chemistry, J. A. Ambler of the Bureau of Chemistry and Soils, Washington, D. C., presented a paper on "The Reaction Between Amino Acids and Glucose" which will be of great interest to every manufacturer of canned syrups sterilized by heat for it explains the formation of gas in this kind of product during and after sterilization although no living bacteria are present. That the gas formation is due to purely chemical reactions has been known for some time, but Ambler shows how it comes from the reaction between glucose and certain of the amino acids.

· SELECTED · PATENTS ·

Treating Dried Fruits

Thomas W. W. Forrest, Fresno, Calif., assignor to Sunland Sales Cooperative Association, Fresno, Calif. No. 1,683,068. Sept. 4, 1928.

Dried prunes or dried figs which have become "undesirable" through the appearance of whitish amorphous sugar deposits on their exteriors may be reconditioned whether they are in bulk or in package form by warming them to temperatures below 212 deg. F. for periods varying between 15 minutes and 6 hours. By this treatment the sugar on the surface is dissolved in the juice of the fruit itself and reabsorbed without the fruit becoming sticky or adhering to the package in the case of fruit already packed.

In using the method, should the fruit be too dry, it is necessary to bring the moisture content within the definite limits of 16-18 per cent for figs and 19-21 per cent for prunes, which may be accomplished by washing and redrying to the correct water content.

Improvement of color, gloss and flavor are claimed.

Treating Food Products in Closed Containers

John Coyle, Baltimore, Md., assignor to Continental Can Company, New York, N. Y. No. 1,681,101. Aug. 14, 1928.

The invention of Coyle is simply explained by describing it as a new type of continuous pressure cooker. The mechanism within the case of the cooker is illustrated by nine drawings that well amplify its verbal description.

Movement of the cans is brought about by successive raising and lowering of transverse bars constituting a floor upon which the cans rest. The movements of the bars constitute a wave motion with the cans riding in the "trough" of the waves, the "crest" occurring when the bars are at their maximum height.

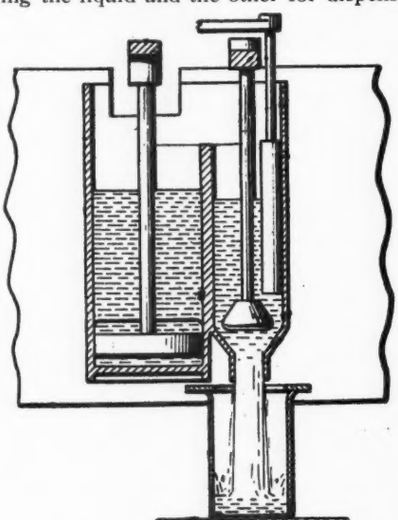
This successive elevation and lowering is brought about by eccentrics driven by a ratchet operating from the motion of other eccentrics on a separate main drive shaft. These driving eccentrics are paired one having a large, and the other a small, throw. They operate ratchet wheels that are opposed with respect to the motion imparted to the secondary shaft but, by reason of the differences in their throw, the larger one produces the maximum effect.

Two objects are gained by this peculiar two-step-forward-and-one-step-back motion, namely agitation of contents and agitation without prolonged progressive travel that would entail a larger piece of apparatus than is now employed. If so desired, the backward motion ratchet can be disconnected thus allowing the cans to travel straight ahead in an intermittent motion. There are several layers of bars within the cooker each of which carries a layer of cans. When the cans reach the end of their horizontal travel they are gently lowered to the next level and travel back toward the other end. Moving the cans in and out of the case while pressure exists inside is accomplished by the customary rotary valve.

Liquid Measuring Valve

Charles H. Ayars, Salem, N. J., assignor to Ayars Machine Co., Salem, N. J. No. 1,683,120. Sept. 4, 1928.

A device for use on filling machines, being particularly adapted to canning operations. It consists of two parallel cylinders, one of which is for measuring the liquid and the other for dispensing it into a can while the whole apparatus is revolving.



The measuring cylinder is in reality a pump in which the piston is raised and lowered by a cam motion. At its low point the top of the piston is below a port that opens to the central reservoir. By raising the piston the entrapped liquid is elevated and pours over into the dispensing cylinder while any excess overflows to the reservoir. Escape of the liquid from this point into a can is by means of a valve at the bottom that is opened by pressure from below by the can itself. It thus possesses a no-can-no-fill feature that is highly important in canning machinery.

Adjustment of volume of fill is accomplished by raising or lowering a displacement member that hangs in the dispensing cylinder and regulates the amount of liquid it may contain.

Extracting the Starch and Protein Contents of Rice

Otto Jaschke, Crowley, La. No. 1,681,118. Aug. 14, 1928.

Rice, possessing a starch content greater than any other raw material, is little used as a source of starch because of the difficulties involved in its extraction.

Jaschke solves the problem by grinding the dry grains to a fine flour, macerating in an alkaline liquid, and decanting the supernatant liquor. This is followed by washing and another decantation. The wash waters, alkaline digestion liquor and certain other wastes are collected, neutralized, and prepared as a protein cattle feed.

The starch itself is now agitated with water, ground again in a wet mill, such as a buhr-stone mill, and then sieved or bolted. Next it is purified in special centrifugals for handling crude starch designed by Schrader, 1904, U. S. Patent 757,778, finally passing into a drying centrifugal. As green starch, its present water content of 30 to 40 per cent is next reduced to 18 to 20 per cent by means of a continuous drying kiln in a manner that avoids pasting.

Freezing Fish

Paul W. Petersen, Bay City, Mich. No. 1,681,009. Aug. 14, 1928.

This patent concerns itself with juicy or watery comestibles such as fish, varieties of meats, fruits, and similar foodstuffs; all notably subject to deterioration from their fresh condition. In this process the comestible, fish, for example, is first washed with a germicide or fungicide and then frozen in such fashion that a part of the solution of the germicide will adhere to the surfaces of the product and thus be available in convenient form to mix with the moisture that may develop upon thawing. He states that a solution of sodium hypochlorite is suitable when used in concentrations of about one-tenth of one per cent or less. Apparatus covered by his patents No. 1,422,126 and No. 1,528,891, and applications now pending, has proven satisfactory for the refrigeration of comestibles after they have been washed in such preservative solutions. The comestible to be frozen is packed in a container the walls of which possess high heat conductivity, and then immersed in a refrigerating liquid. Calcium chloride solutions have proven satisfactory for the refrigerant.

The patent contains a discussion of the scientific theory underlying quick freezing and emphasizes the necessity of freezing the comestible at a temperature below its cryohydric point. The inventor believes that the reason for the

detrimental effect of varying temperatures upon articles kept in cold storage is that cryohydrates or eutectics may melt at microscopic foci producing "thawing points" which can be discovered by cutting in two a piece of the frozen comestible. In many cases drops of the liquid will appear. These may freeze again and this time produce coarse ice crystals that may break down the cell tissues. The object of the germicide is to have a substance present which will tend to preserve the tissues when the frozen comestible has been thawed out. He recommends glazing by immersion in pure water, in accordance with his Patent No. 1,388,298.

Recovery of Buttermilk Butter From Buttermilk or Whey

Arthur L. Rushton, Omaha, Neb., assignor of one-half to Munson H. Lane, Washington, D. C. No. 1,683,728. Sept. 11, 1928.

Buttermilk is known to contain variable amounts of butter fat in a state of division too small to be recoverable in the usual centrifugal cream separator. Adsorption of casein may also hinder its separation. In this process buttermilk is treated in such manner that a clear whey is obtained. It is then run through a centrifugal separator for a relatively long time, giving a so-called buttermilk cream containing from 2 to 3 per cent of butter fat. This cream may then be churned for recovery of the butter or it may be processed to obtain butter oil.

The treatment consists of neutralizing the buttermilk with lime, or lime and soda, and the addition of 0.125 per cent of trisodium phosphate, or 0.25 per cent ammonium acetate when only lime is used. These agencies are used "to precipitate the larger particles of casein containing only a small percentage of the butterfat . . . to make a clear whey as free as possible from casein in suspension for the purpose of . . . dissolving or softening to some extent the caseous matter surrounding the minute globules in the buttermilk."

A feature of the invention is that the length of time of exposure to centrifugal separation is increased from three to twenty times the time normally used for separating cream from sweet milk.

Milk Bottle Case-Washing Machine

I. R. Hippenmeyer, Waukegan, Ill., assignor to the Creamery Package Mfg. Co., Chicago, Ill. No. 1,684,828. Sept. 18, 1928.

A continuous case-washing machine so planned that the cases are thoroughly cleansed while the bottles returned to the dairy are going through their washing process in another form of apparatus (U. S. Patent No. 1,684,827).

Copies of Patents

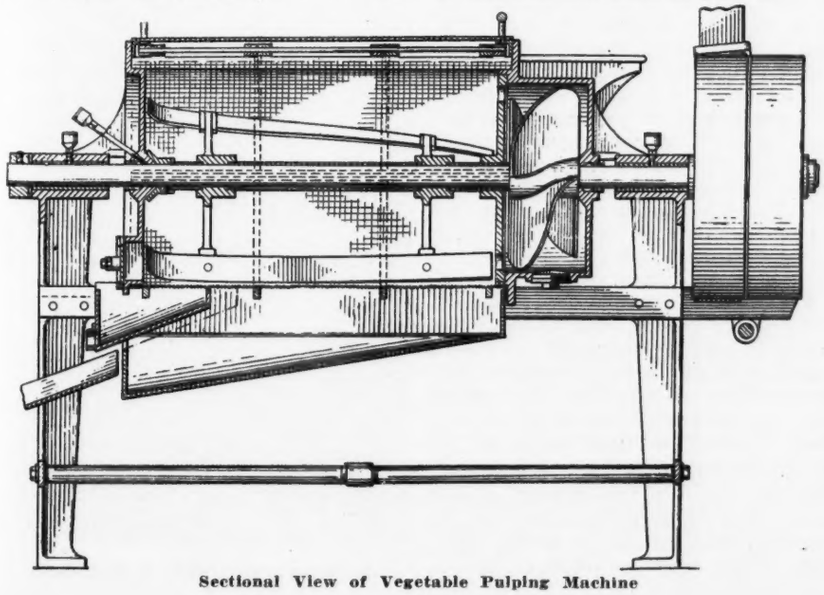
Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

Photostatic copies of foreign patents may be obtained at the same address, prices being forwarded on application.

Vegetable Pulping Machine

John Schmidt, Hoopeston, Ill., assignor to Sprague-Sells Corporation, Hoopeston, Ill. No. 1,683,705. Sept. 11, 1928.

A pulper in which tomatoes or other vegetables are ground to a pasty condition before being introduced to the beaters by a multi-bladed propeller. The beaters are likewise multi-bladed instead of having the customary two blades. Another interesting feature is the adjustable division of the receptacle for receiving the juice by means of which the pulp coming through the screens may be classified into different grades.



Sectional View of Vegetable Pulping Machine

Soya-Bean Flour

George Albers, Seattle, Wash. No. 1,684,654. Sept. 18, 1928.

Soya-beans are expressed, to obtain the oil, leaving the press cake, which is then broken up and ground to a meal. This is followed by drying to 10 per cent moisture content and is then cooled. A second grinding follows and then another drying operation, bringing the moisture down to 8 per cent. After this it is ground to flour and bolted, giving a flour containing about 47 per cent protein content.

Development of Vitamin D

Harry Steenbock, Madison, Wis., assignor to Wisconsin Alumni Research Foundation. No. 1,680,818 Aug. 14, 1928

The actual title of this patent is "Antirachitic Product and Process." The invention relates particularly to the preparation of edible products such as foods and medicines, and the purocess of generating or developing the antirachitic principle is one of activating the material by subjecting it to the action of ultra violet rays.

It has long been known that cod liver oil is an excellent therapeutic agent for the cure of rickets (deficient calcification of bones) in children, but owing to its unpalatability it is not well adapted for use in foods or medicine. Steenbock states that the earlier belief that fats in general possess the antirachitic principle is unfounded and that it is now known that the principle is not generally distributed in nature—a fact that is attested by the prevalence of the disease to a surprising degree in mankind and the lower animals.

He cites E. A. Park: *The Etiology of Rickets,* "Schmorl found that 90 per cent of the children in Dresden under four years of age who died between the years 1901 and 1908 and more than 96 per cent of the infants showed evidences of rickets, and Hess himself has reported that rickets was exceedingly prevalent among the children in the Hebrew Infant Asylum in New York City, where presumably the chemical investigations of the blood were made."

The irradiation of foods and feeds will impart to them the antirachitic property that is known to be a cure for the disease. Also it is practicable to treat a portion of the ingredients of a feed and mix with the other unactivated ingredients. Butter fat may be activated without the destruction of its vitamin A if carried out in an inert atmosphere.

The unsaponifiable constituents of oils and fats may be activated either before or after separation from the parent material and in the latter case contain the vitamin D in a more concentrated form.

By prolonged irradiation it is possible to destroy the antirachitic principle after it has been generated in foods, and the palatability of the food itself may be injured in the same manner. "Appar-

ently in the case of fats (including oils) some changes ultimately occur in the non-activated constitutents which neutralize or destroy the antirachitic principle previously produced by the treatment in the unsaponifiable fats."

Eight claims are allowed which are summarized briefly as follows:

1 The process of irradiation by ultra violet light to impart the antirachitic principle, but limited in such manner as to avoid destruction of the principle;

2 The process as applied to oils and fats containing unsaponifiable lipoids;

3 The application of the process to glycerides that are naturally liquid;

4 The application of the process to olive oil;

5 The application of the process to food substances naturally deficient in the principle;

6 The application of the process to naturally deficient liquid glycerides;

7 Olive oil antirachitically activated by the process;

8 The process of claim No. 1 but so limited as to avoid destruction of palatability, as well as to avoid destruction of the vitamin.

Separating Thistle Buds from Shelled Peas

Ogden Sells, Hoopeston, Illinois, assignor to Sprague-Sells Corporation, Hoopeston, Ill. No. 1,683,-703. Sept. 11, 1928.

When thistle buds are thrown into warm water the air enfolded within the petals will expand sufficiently to cause them to float while shelled peas will sink in water of any temperature. The exact temperature must be suited to the needs of the situation and has been found to vary normally between 115 deg. F. and 140 deg. F. The method gives a complete separation and the thistles may then be skimmed off.

PRACTICAL · OPERATING · DETAILS

Disposing of Nuisance Waste Steam

One of the disagreeable features of cooking in open tanks and kettles is the constant evolution of steam from the surface of the hot liquid. If it so happens that suitable ventilation exists for drawing the vapors out of the room in which the cooking is done no serious problem is presented. However, unless proper ventilation is provided with this purpose in view there is every probability that the presence of great clouds of steam in the air will become a nuisance, if not an actual danger, at certain times of the year .

During the warm months when open doors and windows permit its easy escape to the outside no difficulty is experienced but in cold weather there is a constant drip of condensation from cold walls, windows, and uninsulated roofs. Because it may contaminate food stuffs exposed in open vessels the ceiling drip may be extremely undesirable, although as a rule it is more of a nuisance than a source of contamination. The large quantity of vapor in the air may become a source of danger in very cold weather, as it did in the present instance, owing to the fog that filled the atmosphere from the ceiling down to a point about two feet above the floor.

In this factory the cooking was done at one side of a room in which also a crane and an electric hoist were frequently carrying loads through the occasional fogs at heights that might strike a person without his being aware of impending danger. Furthermore workmen pushing trucks would lose their bearings and time would be lost in backing up to start again in the proper direction. It will be understood, of course, that the condition of fog was an abnormality that occurred very seldom and only during cold snaps.

As first planned the steam-jacketed kettles were to be enclosed in a box having a hinged lid supported by counterweights. It was proposed to exhaust the vapors from the box by means of a suitable blower by keeping the lid closed while cooking. This was entirely satisfactory as long as the box was closed but unfortunately it became necessary to stir the contents of the kettle during the cooking period. Mechanical stirrers were quite out of the question; the operation was distinctly one that must be performed by hand and, of course, to do this the lid must be left open with the natural result that steam escaped into the air at all times. Occasionally it blew into the face of the operator who would be momentarily blinded if, unfortunately, he wore glasses, and otherwise he might experience temporary discomfort.

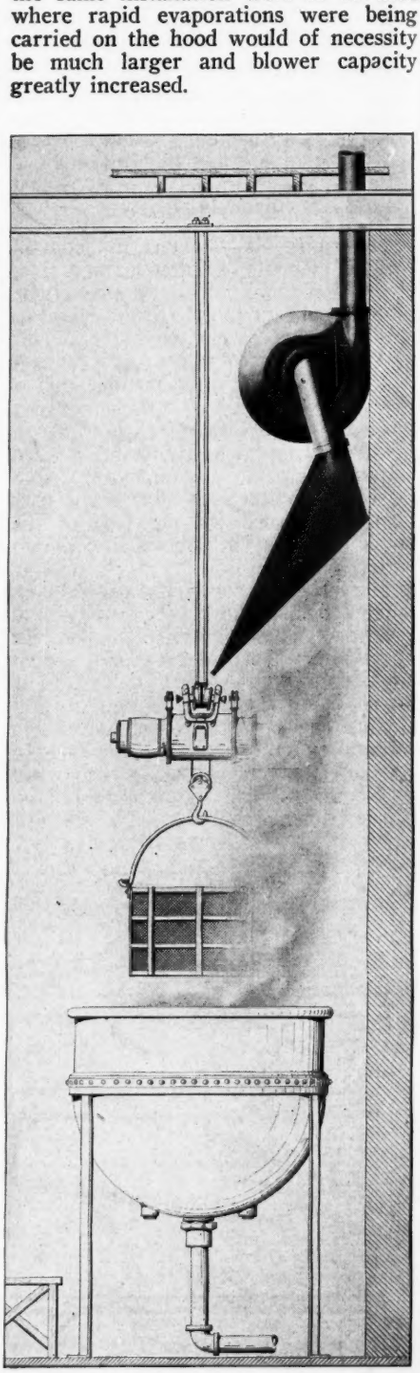
The product to be cooked was carried in wire baskets, which together with their contents weighed about 400 lb. each, thus requiring a hoist operating on a monorail to lift them in and out of the kettles. The location of the monorail was determined as far as its height was concerned, by the exigencies of the situation. It must be high enough to permit lifting the baskets clear of all objects and apparatus and yet be low enough to pass under certain 6-inch pipes, and furthermore it must be centered over the kettles.

The problem, although not often a serious one, involved one of those fine points of factory operation that most superintendents dislike to witness daily as reminders of something left undone.

It is a fact well known to all who have observed an open fireplace that hot gases ascending near a wall will hug the wall. In this instance it was noticed that the vapors arising from the boiling kettles spread in a thin layer next to the wall as indicated in the sketch. When this observation was made a half hood was constructed as shown and the vapors, rising up close to the wall, approached the hood and were then removed by means of a blower along the exhaust line above.

The blower capacity used was 1,000 cubic feet of air per minute per kettle. While no tests have been conducted to determine if a lesser capacity would be satisfactory, it appears from simple observation that a somewhat smaller blower might be expected to serve equally well.

The kettles were 300 gallon capacity and were boiling very gently. No effort was made to evaporate any liquid. If the same installation were to be used where rapid evaporations were being carried on the hood would of necessity be much larger and blower capacity greatly increased.



Removing Vapor With a Half Hood

MANUFACTURERS' · NEWS · AND · EQUIPMENT

John Bean Manufacturing Company Merger

The announcement of the merger of the Anderson-Barngrover Manufacturing Company of San Jose, Calif., with the Bean Spray Pump Company of San Jose, Calif., and Lansing, Mich., was made on Oct. 11. The new corporation will be known as the John Bean Manufacturing Company. The Anderson-Barngrover Company are well-known manufacturers of canning machinery and equipment for manufacture of dried fruits and the Bean Spray Company manufactures spraying outfits, fruit washers and other orchard equipment.

W. C. Anderson, former president of the Anderson-Barngrover Company, becomes chairman of the board and John D. Crummey is to be president.

The consolidation has been effected for the purposes of improved manufacturing and better servicing facilities. No changes in policies or sales representatives are contemplated.

Tomato Refuse Pump

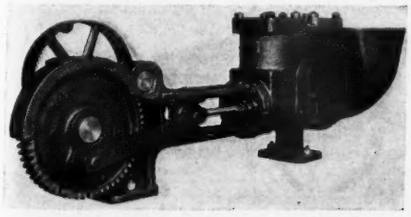
Soft refuse of a very sloppy nature accumulates in certain types of food manufacturing establishments, particularly in canning establishments devoted to tomato products or pumpkin. The amount of materials to be handled and disposed of may amount to as much as 25 tons per day in the larger factories.

Few plants can flush this refuse into local sewers owing to the danger of stoppage of drains and also the huge volume of water required to move this amount of material.

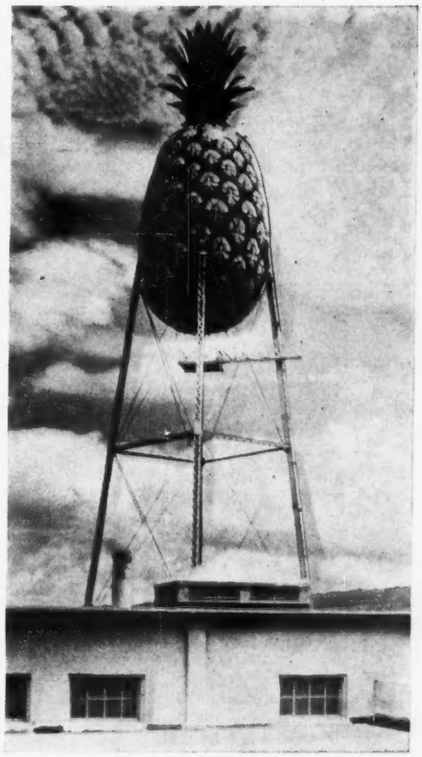
A further problem is presented by the tendency of this form of refuse to accumulate in factory gutters, drains and sumps from which it must either be removed by laborious hand work or else by mechanical means. Of the latter, pumping is the simplest method provided the material is kept sufficiently wet.

There are several small pumps on the market for this service, the latest being an offering of Dean Brothers Company, Indianapolis. Their pump is a belted, gear driven pump of peculiar inside construction which permits gravity flow of refuse into the pump cylinder through a large port located at the base of the hopper seen in the illustration. At each stroke of the double acting piston the travel is sufficiently great to uncover this large opening directly into the cylinder. The sloppy refuse now flows in and fills it. On the return stroke the piston moves past the port and thus closes it and then forces the contents of the cylinder through the discharge valves and thence into the dicharge pipe that may deliver it wherever desired. At the same time the other end of the piston clears the same port opening and the process is repeated, giving the double action necessary to smooth running.

Soft objects as large as tomatoes may be handled. It is necessary to have sufficient liquid present in the hopper to seal the port.



Pump for Tomato Refuse Disposal



Hawaiian Pineapple Company's Water Tank

Putting the Water Tank to New Uses

The advertising value of a water tank has been utilized from time to time by manufacturers of products that are capable of publicity in this manner. Milk bottles and beer bottles have been known to be used with telling effect, but it has remained for James Dole of the Hawaiian Pineapple Company to erect a water tank in the shape of a huge pineapple. This tank, with a capacity of 100,000 gallons, surmounts the office and warehouse and supplies the automatic sprinkler fire protection systems. It was made by the Chicago Bridge and Iron Works.

High-Speed Production

Packers of seasonal crops must always race against time because, in spite of plantings scheduled to spread the harvest period over a wider range of dates than would otherwise occur, the operating period is short at best. From four to six weeks is usually the limit and that many plants valued at from one to two hundred thousand dollars are able to make a profit at all, when their working year is no longer than a good vacation, is ample testimony to their efficiency.

Canning machinery is now working at very high speeds and organizations based on mere skeletons of permanent personnel must jump into high gear like a flash. New records are made every year. The 1928 record for vegetable canning seems to be held by the Milford Canning Co., Milford, Ill. On one day in September it packed 20,400 cases or 489,672 cans, of sweet corn.

A better idea of the amount of work accomplished is gained by the realization that in a 24-hour period the production was approximately 25 minimum carloads. The ears of corn handled weighed over 700 tons, and was the harvest from more than 1,400 acres.

General Seafoods Enlarges Capacity

In a very short time the General Seafoods Corporation of Gloucester, Mass., will be producing more than double its present output. The plant is enlarged, and additional equipment including machinery for cutting, filleting, packing, and quick freezing is being installed. No change of products is planned.

New Automatic Coal Burner An Operating Economy

A new model stoker, available in sizes for 60 to 1,000-hp. boilers, has recently been brought out by the CoKal Stoker Corporation, Wrigley Building, Chicago, the features of which are that it starts and stops automatically by fluctuations of steam pressure with automatic control of boiler damper, air supply, over-fire air supply, stoker bars and rate of coal feed, thus maintaining a close steam pressure regulation regardless of the lightness or heaviness of the load. Once the equipment is set for a given steam pressure and a given combustion efficiency or CO_2 the stoker will work indefinitely.

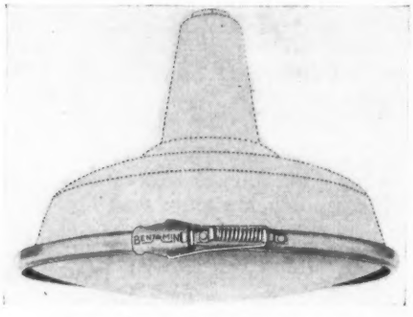
The CoKal-O-Matic Coal Burner burns screenings, with a claimed saving in many cases of 25 per cent over hand firing. By combining three combustion

methods in one, namely, coking, spreading, and pulverized coal burning, combustion is rendered smokeless from lightest loads to heaviest over-loads. According to records on hand the ordinary installation will pay for itself in two years while exceptional installations have been known to save their cost within a period of three months.

Better Illumination With Clean Lights

This cover has been developed to meet the demand for a light weight, economical device that will guarantee the original efficiency of lamps and reflecting surfaces of Benjamin Industrial Lighting Equipment. These vital units of the industrial lighting system are afforded complete protection against dust and dirt resulting from manufacturing operations. The cover is easily kept clean by simply wiping off the surface of the glass disk, thereby restoring the initial light output.

According to the manufacturer, the Benjamin Electric Manufacturing Company, Chicago, the outstanding features of this new cover are easy attachment, simplicity, dependable service, light weight, and low price. To attach, merely slip the retaining band over bead of reflector and snap locking lever into



Dust Cover Device for Lights

closed position. The cover is simple in design with only three parts and is dependable in that it is virtually impossible for the cover to work itself loose from the reflector as the tension is not released even though the spring should break. The weight of the cover is in most cases less than that of the reflector, making it very convenient and easy to handle.

Modern Canning Plant for Russia

A modern vegetable canning plant is being constructed at Grozny and is to be equipped with the latest type of machinery of foreign make with a capacity of 1,000,000 cans per year, according to a report from the American-Russian Chamber of Commerce. Figured in American car loads this will be a production of approximately 40 minimum cars.

Lucidol Corporation Now Separated from Novadel Process Corporation

The ownership of factory and Lucidol business of Novadel Process Corporation has been transferred to the Lucidol Corporation, effective October 1. After November 15, the Lucidol Corporation's offices will be located at the factory, 239 Larkin St., Buffalo, N. Y.

Dr. F. Visser't Hooft, former Production Manager of Novadel Process Corporation, has been elected vice-president of Lucidol Corporation and will be in charge of the Buffalo office after he returns from abroad.

MANUFACTURERS' CATALOGS

Bulletin No. 400, Eimer and Amend, New York—The Improved MacMichael Viscosimeter is an improvement over the older well-known instrument for measuring viscosities from a little above that of water to viscosities of thick glues. In the food industries it has been used for flour testing; for the grading of gelatines and ice creams; for starches; chocolate and cocoa; dairy products; and sugar solutions.

General Electric Company, Schenectady, N. Y.—Wound-rotor Induction Motors, "900 Series" suitable for use on polyphase circuits where frequent and heavy starting service is involved, or where low starting current is imperative, are supplied in sizes from ¾ to 10 hp., for 220, 440 and 550 volts, designed for continuous duty at 40 deg. C. —GEA-71B.

High Torque Double Squirrel-Cage Motors for constant speed, continuous duty at 40 deg. C. with high starting torque and not requiring compensators —GEA-81B.

Pressure and Vacuum Switches, CR 2927, a.c. or d.c. from Maximum Pressure of 200 lb. per sq.in. to maximum vacuum of 28 in. for motors of 2, 3 or 5 hp. 110 or 220 volts and 1 hp. 550 volts—GEA-821A.

Sturtevant Tempervane Heating Units. Catalog No. 363, B. F. Sturtevant Co., Hyde Park, Boston, Mass.—Unit heating for industrial establishments by means of air blown through Aerofin Heating Elements is described for use with both low and high-pressure steam. Data covering heating capacity, air volumes and velocities, horsepower required, are presented together with full page charts for calculating any condition that will be met, and for selecting the proper size of heating unit. Also tables of conduction and radiation losses through various building materials, and methods of calculation of these losses, are given.

Waltham System, Inc., Box 58, Waverly, Mass.—Comprehensive Data on the Waltham System of Complete Iceless Refrigeration. A presentation of cost data on refrigerating ice cream during distribution and at dealers' stores by means of cartridges frozen to ten degrees below zero in the manufacturers' chilling rooms.

Mixing and Storage Tanks by Glascote. The Glascote Company, Euclid, Ohio.—Illustrations and data covering open and closed, mixing or storage tanks lined with glascote including dimensions, capacities, weights, and specifications.

Buflovak Milk Dryers and Evaporators. Bulletin 240, Eighth Edition, Buffalo Foundry and Machine Co., Buffalo, N. Y.—Descriptions of single and double effect milk evaporators, showing principles of operation; tables of sizes and capacities when evaporating to different concentrations, steam consumption, boiler horsepower and cooling water required. Also similar forms of description and data relative to double drum dryers, operating at atmospheric pressure and single drum vacuum dryers, knife grinders, sanitary milk pumps and vacuum pumps.

The New Pfaudler Continuous Automatic Milk Holder. Bulletin No. 695, The Pfaudler Company, Rochester, N. Y. — Automatic pasteurization of milk by the holding process is made possible and is accomplished by the new equipment described in this bulletin. Complete description and specifications as well as important operating data are presented.

The Care of Solid Nickel Dairy Equipment. The Klen-O-Cide Company, 1044 N. Latrobe Ave., Chicago. —Methods of keeping nickel equipment clean, bright and sterile.

Something New for the Milk Industry. Dominion Chemical Company, Syracuse, N. Y., and Chicago. — Dominion Nickle Cleaner is described with methods of application.

York Refrigeration. Bulletin No. 141, York, Pa. units for the business where the refrigerating requirements are small.

York Milk Pumps. Bulletin No. 130, York. Direct motor driven, tinned brass centrifugal pumps for milk, sizes 1, 1½ and 2 inch.

York Surface Type Milk and Cream Coolers. Bulletin No. 192.—Three section, 1, 1½ and 2 inch, surface type, tubular coolers.

York Plate Type Heat Exchanger. Bulletin No. 132.—Regenerative heat exchanger in which additional heating is done by means of warm water instead of steam. York Ice Machinery Corporation, York, Pa.

New 1929 "C-Gals" With Complete Plant Hook Ups. Catalog No. 701, The Pfaudler Company, Rochester, N. Y.—Specifications and layouts for well balanced plants for bottled milk, ice cream, and butter milk of different capacities. Also description of plug-type leak detector flush valve.

· NEWS · ITEMS ·

Douglas Patents Validated

In the case of Douglas Pectin Corporation v. Armour & Company, No. 219, Circuit Court of Appeals for the Second Circuit, Judge Augustus N. Hand delivered the Court's decision that the Douglas patents are valid and were infringed.

The case was appealed by the Douglas Pectin Corporation from the decision of the District Court for the Western District of New York which had previously ruled that Patents No. 1,082,682 and 1,304,166 were invalid due to prior art. Patent No. 1,235,666 of the Douglas corporation had been held valid in the lower court and was not in dispute.

The opinion of the court of appeals is an intensely interesting document to any one who has an interest in the manufacture of pectin, jellies, jams or marmalades. It contains, in addition, much information of a distinctly historical nature regarding the methods of making jelly as far back as 1885, although, as the Court indicates, much of the testimony covering early practices is dependent upon the memory of witnesses over a period of so many years that the Court regarded it as "too unsubstantial to meet the severe tests required to establish a prior use. . . . Mere recollection as to such remote events cannot be allowed to defeat a patent."

Patent No. 1,082,682 covers the manufacture of pectin, a substance adapted particularly for use in jellies, jams and preserved fruits, in which apple pomace is treated with boiling water containing an acid to dissolve the pectin. The pectous liquors are nearly devoid of sugar so that when concentrated a thick viscous liquid is obtained that does not jell nor solidify.

Patent No. 1,304,166 relates to a process for making jellies and jams, by the use of the concentrated pectin. Its novelty lies in the fact that by using this process the otherwise long boiling of fruit juices is eliminated and no loss of flavor and aroma of the fruit is entailed.

The removal of natural starch from the pectin by means of an enzyme such as malt diastase is covered by Patent No. 1,235,666. The natural starch caused a turbidity or cloudiness of jellies that was undesirable until the discovery was made that it could be converted into soluble sugars by hydrolysing by means of diastase.

The opinion of the Court clearly indicates that it differentiates between the use of concentrated pectin made by the Douglas process and the much older method of making jellies and the like with apple pectin made by boiling the pomace with water.

The decree of the lower court was reversed with respect to Patents Nos. 1,082,682 and 1,304,166 and affirmed as to Patent No. 1,235,666.

The Certo Corporation, as the Douglas Pectin Company is now called, secures a complete victory and is consequently the only company now able to manufacture this product and to grant licenses for making jams and jellies by the "Short Boil" method.

Greek Specifications Exclude American Flour

The substantial business formerly enjoyed by American millers has been virtually wiped out by the drastic and rigid specifications for low grade flour established recently by the Greek government, according to Dr. F. A. Collatz, chairman of the Committee on Flour Specifications of the American Association of Cereal Chemists.

In order to determine what scientific basis may exist for the official Greek method of determining acidity in flour, several large milling companies have subscribed to a fund to engage the services of an abstractor who will review both the chemical and medical literature of the world in search of any substantiating publications. Laboratory work also will be carried out, under direction of members of the committee to determine the correlation between the official Greek and the official A.A.C.C. methods and the acidity of low grade flours.

Coming Events

NOVEMBER

3-10 — Pacific International Dairy Products Show, Portland, Ore.
12-16—Annual Convention, American Bottlers of Carbonated Beverages, Detroit.
15-16—Semi-annual meeting, Miller's National Federation, Chicago.
19-24—Second International Conference on Bituminous Coal, Pittsburgh.
19-24—Pacific Slope Dairy Show, Oakland, Calif.
20-22 — National Creamery Buttermakers Association, St. Paul.
21-22—Wisconsin Cheese Makers Convention, Green Bay.
30—Canadian Association of Ice Cream Manufacturers, Toronto.

DECEMBER

3—Power Show, New York.
3-8—International Live Stock Show, Chicago.
4-5—Western Canners Association, Chicago.
27-2 —American Association for the Advancement of Science, New York.

JANUARY

3-5—Northwest Canners Association.
21 — Junior National Convention, American Society of Bakery Engineers, San Francisco.
21-25—Annual Convention, National Canners Association, Chicago.

Shrimp Packers Win Verdict

The opinion of the U. S. Supreme Court, delivered by Mr. Justice Butler, in the appeal of the Foster-Fountain Packing Company and the Sea Food Company v. E. J. Haydel, L. R. Cabriac, *et al.*, held that the appellants were entitled to a temporary injunction restraining the enforcement of a Louisiana statute regulating the taking and canning of shrimp taken from waters within the state, and that the lower court's refusal to grant a temporary injunction was the result of improvident exercise of judicial function.

The statute in question appears to have for its purpose the requirement that any shrimp caught in Louisiana must be canned in that state inasmuch as it makes unlawful the exporting of any shrimp from which heads and hulls have not been removed.

The Foster company is a Louisiana corporation under contract to catch Louisiana shrimp and deliver them to the Sea Food Company, a Mississippi corporation in Biloxi. The enforcement of the Louisiana "Shrimp Act" of July, 1926 would have destroyed the business of the Sea Food Company.

Legal redress sought in the lower courts in the form of a temporary injunction was denied but the Supreme Court reversed the decree when it became evident that the law was not intended to conserve the resources of the state but to compel the canning of Louisiana shrimp within the confines of Louisiana.

Canadian Tariff Board Hearings Announced

Hearings to be held at Ottawa have been announced by the Canadian Advisory Board on Tariff and Taxation for the consideration of proposed changes in duties or taxes, Commercial Attaché L. W. Meekins, at Ottawa, informs the Department of Commerce.

The following products are to be considered:

November 6—Reduction in the duty on malt extracts and the cancellation of the excise tax on malt used in making yeast; reduction in the duty on malt sirup powder; an increase in the duty on sardines and herring.

November 7—General revision of the duties on nuts, an increase in the duty on salted peanuts, reduction in the duty on unsweetened desiccated cocoanut, and the free entry of clay-working machinery.

Changing Dietary Habits Affect Distribution of Many Important Foods

By Paul Wooton
Washington Correspondent Food Industries

TRENDS in living practices in cities and towns are having an important bearing on the distribution of food products. Present-day activities among women, an increasing popularity of the multiple dwelling, the difficult servant problem and the development of the restaurant business are regarded as the principal factors bringing about a major change in the methods of living. While no figures are as yet obtainable, observers at the Department of Commerce are convinced that a rapid increase is going on in the percentage of foodstuffs marketed through public eating places. They point out that there is a vast improvement in the restaurant of today over that of a decade and more ago. There has been a great advance in the technique of food preparation in such institutions. Sanitary conditions surrounding them have been bettered to the point where there now is little question as to the cleanliness and wholesomeness of food served in these places. The rapid growth of the neighborhood restaurant has added the element of convenience, with the result that a greatly increased proportion of all meals eaten in cities and towns are in these establishments.

Eating Habits Changing

The restaurant buys in quantities and on commercial standards. As a result, waste is being eliminated and food in many instances is reaching the ultimate consumer through restaurants at a lower price than when it is purchased directly by the housewife. In this connection it also has been noted that the rise of the neighborhood restaurant has been accompanied by a corresponding decline in the neighborhood delicatessen store. It also is believed that the tea-room craze has passed its peak and that this type of high-cost eating place is giving way to more simple surroundings and large establishments where more of the consumer's dollar goes into the food itself. The same reasons which operate to secure more business for the restaurant also are thought to be responsible for the greatly increased volume of sales at bakeries.

Better refrigeration, both in restaurants and in the home, is resulting in a larger amount of quantity buying. This is reflected in the demand for large sized units in canned goods, has eliminated waste which in the aggregate is an impressive amount, and is having some effect in increasing consumption of fresh fruits and vegetables. It is expected at the Department of Commerce that this influence on distribution will become increasingly marked as mechanical refrigeration becomes cheaper and the factor of reliability rises.

Whenever the Department of Commerce attempts to perform service for the food industries it finds itself handicapped in nearly every instance by lack of statistics. This is common to all industries to a more or less degree on the side of distribution, but some production figures are available in nearly any other activity. A beginning is being made in the collection of figures on stocks but those who must be relied upon for these figures apparently have not formed the habit of compiling statistics. Much resistence must be overcome on the part of individual concerns but there can be no doubt of the general desire of those engaged in the business to have more illumination on the field of their activities. They realize that buying cannot be done intelligently if there is no knowledge of surpluses and shortages. Strong support for more statistics, however, is coming from the operators of chain stores and from many large wholesale and jobbing interests.

A special study of costs of handling canned goods in wholesale and retail establishments has been begun by the Department of Agriculture. R. R. Gilbert, who has had wide experience in the wholesale grocery business, has been engaged for the purpose. He is now in the field gathering the data. His study will cover more than 500 items of kinds, types and grades. Among other things this study will show the length of time required for turnover.

In the very near future the food research division of the Department of Agriculture hopes to have its vacuum method of canning tried out on a commercial scale. Thus far, experimentation with this process has been confined to peas, beans and corn. When these products are packed in cans all of the water possible is kept out. Later a portion of the air in the can is withdrawn. When cans thus prepared are heated the moisture contained is sufficient to produce steam which accomplishes sterilization. By this method there is a decided improvement of the quality, the research division contends, and it is believed that consumers will prefer these products free from liquid in the can.

Federal Warehouses and State Control

Litigation involving the warehouse act is reaching a stage which is expected soon to determine the extent to which states may interpose their own restrictions on federal warehouses. Federal authorities contend that these restrictions are hampering the use of federal warehouses which have come to be an important step in the distribution of canned goods, peanuts, potatoes, beans, cottonseed, cold-pack fruits, syrups and grain. The receipt from a federal warehouse is accepted by banks throughout the country as collateral for their commodity loans.

The food research division is making rapid progress with its consumer studies as to individual preferences of foods. For instance, the questionnaire on meats has gone to 5,000 housewives in seventeen states. By establishing the food preferences of the people an important step will have been taken, it is contended, toward more intelligent forecasts of demand. The questionnaire on apples has been circulated in New York City alone, with the idea of determining the kinds of applies that are likely to sell in that community and the relative proportions of the demand.

Recent palatability tests by the Department of Agriculture on leg of lamb has determined that there is a wide range of quality in this meat. It is believed that there is need for the setting up of better grading of lamb and for a definite demarcation between lamb and mutton. The Department's experience and observations have shown to the satisfaction of its experts that it is a fallacy that wool and meat cannot be improved at the same time. The average weight of fleece has been increased four times since 1840 and the meat of one of the best breeds of wool producers has been proven to be of the very highest quality.

Foreign Import Restrictions Bar Trade

Great need exists for the revision of import restrictions on canned goods in nearly every country of the world, judging from complaints reaching Washington. This is particularly true in Latin America. In several countries the regulations governing the importation of foods are the cumulative product of a long period of years. Frequently restrictions were levied without due considerations and in most of the countries there is ample reason for going over the rules that have been laid down with a view of bringing them into conformity with American practice. For instance, there is a regulation in one country prohibiting the importation of any food with a tomato content, unless it be in glass containers. Among other things this excludes California sardines which otherwise would be sold in large quantities in that particular country. Another typical regulation is that requiring the use of lacquered tins for any canned product containing acid. This applies to all fruits and many other products. In that connection it is suggested that the American canning industry well could afford to interest its customers in these countries to take up vigorously an early revision of these import regulations.

Kroger to Absorb Piggly Wiggly

Despite published denials of the proposed merger between the Kroger Grocery and Baking Company and the Piggly Wiggly Company, it is understood that the deal will be definitely consummated and become effective in the very near future.

The U. S. Trade in Foodstuffs

By Julius Klein,
Director, Bureau of Foreign and Domestic Commerce

GROWTH in the value of foodstuffs, production and trade, in recent years is most remarkable. Going back to 1914 only, according to figures of the Bureau of the Census, the value of foodstuffs of animal and vegetable origin at the point of production was 4⅝ billion dollars. Corresponding figures for 1925 were 10⅘ billion. Measured in terms of prices paid by consumers, the increase would be very much larger. We have not reached the limit of production, nor of markets. Out of our supplies, we are exporting only about 7½ per cent, and intensive developments of both domestic and foreign markets is but a very recent growth.

Our past history in the export trade in foodstuffs is interesting. Long the main source of Europe's supplies of wheat, beef and hog products, at the present time practically no beef is exported, while Canada now has a greater surplus of wheat to export. As long as we have our Western corn fields we can produce enough hogs for our own needs and have an excess for the rest of the world.

Our development in foodstuffs has been similar to that of our other industries. As a pioneer country our exports consisted largely of crude and raw products. The tendency has been toward the elaboration of such products in this country, sending the finished or more highly manufactured articles abroad. In addition new industries, such as the canning of foods, have been established and grown to sizes unknown elsewhere. These also have contributed to the 884 million dollars worth of foodstuffs which left this country last year.

The promotion of trade in foodstuffs is a very different merchandising problem from that of highly manufactured goods, such as automobiles or typewriters. Merchandising wheat or flour, for example, is largely a question of offering favorable prices in competition with other producing sections. For example, if Argentina or Canada can under-bid Galveston or New York one cent a bushel on wheat or five cents a barrel on flour of equivalent quality they will get the business. It follows then that the size of exports of most agricultural products depends largely on the size of our surplus. Most food products are semi-perishable and, therefore, when we have a surplus it must be marketed within the crop year. In fact, most of the agricultural food surpluses have been based for the past century on the exploitation of new land. This period is largely passed in the United States but is still going on in Canada, Argentina, Australia and New Zealand, and for that reason we are feeling very severely competition, especially in wheat, meat and dairy products.

While we are exporting around $800,000,000 worth of foodstuffs, we are importing large quantities of tropical products such as coffee, sugar, bananas, spices, cocoa and vegetable oils. Our imports of most tropical food products have been steadily increasing due not only to increased population but in most cases to increased per capita consumption. The increased per capita consumption of tropical food products is in accordance with the general tendency of this country to get away from a few of the old standard foods such as bread, meat and potatoes, and to have a more varied diet.

The production of canned goods and shipments of fresh fruits and vegetables have practically doubled in the last ten years. Part of this is due to very much better refrigerating and distributing facilities, not only on the high seas but on the railroads as well. The result is that the average consumer can command even semi-perishable products from all corners of the world.

As to the future trend, no one can make any estimate. For example, we reached a very high export in foodstuffs from 1890 to 1900 due to the enormous surpluses, and then for the fifteen years before the great war there was a steady decline and many began to think we would gradually get off an export basis and the trade would go to the newer countries such as Canada and Argentina. However, with the stimulus of war prices production increased rapidly and we soon doubled our exports. In recent years there has been, in additon, such a rapid growth in efficiency of production in this country that it is tending to offset the low cost of production in the newer countries. The energy of our exporters in finding new markets, high efficiency in the manufacture and processing of foodstuffs, and the new facilities of the Department of Commerce, now co-operating with some 3,000 exporters in foodstuffs, all help to keep the American volume of trade at a high level.

Preservers Vote on Containers

Proposed simplified practice recommendations for preserve jars and jelly glasses were approved at a general conference of producers, distributers and users of these commodities held at Cleveland, Ohio, on September 18, in conjunction with a gathering of the National Preservers Association.

At the request of the National Preservers Association the bureau several months ago conducted a survey on variety, the results of which were reviewed by the simplified practice committee of the industry. After careful study of the consolidated report showing the present production and demand on each size marketed, the committe recommended a tentative project to be presented to the general conference. The proposed recommendation, unanimously approved at the general conference, reduced the variety of preserve jars from 36 to 8; of jelly glasses from 24 to 7.

This recommended simplification is now being submitted to the entire industry for signed acceptances, which must represent 80 per cent of the producers, distributers and users, by volume of annual consumption and production.

AS MAY safely be assumed at the inception of a new journal, the editors of *Food Industries* will welcome contributed articles of an appropriate sort.

Also, and especially, will they be glad to receive their full quota of the less extensive and somewhat informal communications that come naturally and in generous volume to established periodicals, and concern such things as:

—new or improved machinery, described by operating men in the industry or in related industries;

—the use of materials in ways differing from the custom, either as to proportions or product;

—personally developed betterments in plant equipment or practice that might qualify for inclusion among Practical Operating Details;

—new types of packaging;

—news items of a commercial or personal nature.

For such contributions as are published and that seem to be of constructive service to the readers of *Food Industries* adequate payment will be made.

Impressions of the 17th Annual Congress of the National Safety Council, New York, Oct. 1-5, 1928

The development of safety engineering has reached somewhat different stages in the several branches of industry for in those industries that everybody instinctively regards as hazardous it has probably reached a higher development than is the case in some of the so-called less hazardous industries.

Apparently when the realization comes that a given industry, such as public service, is working with death dealing forces and that any carelessness may constitute a very serious hazard, there exists the condition that spurs safety work to its highest development. In the particular field of public service both the intensity and the incidence of industrial accidents is now considerably below the figure for industry as a whole, but unfortunately some branches of the food industries, which at a guess by the layman would be regarded as non-hazardous, have had an experience that lies on the other side of the general industrial average.

But safety implies far more than the prevention of deaths. The loss of time, the inconvenience and suffering of the injured, the waste of materials and wreckage of equipment even where accidents have not resulted in actual death, are also a part of the preventable losses that safety work hopes to prevent. The hypothetical yardstick by which these experiences may be measured is still in the process of formation and the figures obtained thus far are not yet entirely comparable. As measuring methods are developed the true status of industrial hazard will be found for each industry and proper remedies applied.

At the Safety Congress recently held at the Pennsylvania Hotel in New York, the divergence of the development of this work was apparent to an observer going from meeting to meeting.

Uniform Statistics Much Needed

The small subcommittee meetings devoted to the various divisions of the industry carrying on food manufacture held during the last days of the Congress comprised earnest groups who came together to compare notes, to discuss the best methods of obtaining accident statistics and safety data and to attempt to bring to their own group a standardized method of recording experience. With most of them the idea of intensified safety programs is an accepted fact.

One who attended these meetings expecting to learn how to avoid broken toes, slivers, cuts, burns, infections and similar mishaps, including actual death, in his particular field would have been disappointed. Instead, the discussions were an attempt to develop a uniform system of measurement of intensity and time loss. Emphasis was placed on the fact that in order to determine the degree of progress in this work there must be a record of previous experience with which comparisons can be made. Safety is a condition that is developed from within and is one that imposition of external influence can do comparatively little to assist; which is but an elaboration of the older saying that a careful workman is the best safety device.

Definitions of Causes Are Difficult

In some of the subcommittees there was much discussion as to the correct naming of the cause of an accident. The suggested definition of the cause of an accident as "that condition which could be most easily remedied" precipitated a highly interesting argument when applied to the case of a man having no right to be in an engine room who slipped on a banana peel, fell through a pipe railing guarding a fly wheel and was killed. Before the argument started one would little suspect the existence of so many divergent views as to the proper classification to assign to the cause of death. Until a uniform system of classification of causes can be developed comparisons of the experiences of various plants or safeguards will not have as great a value as could be desired.

In similar manner it is necessary to employ uniform methods of recording time lost as a result of industrial accidents. One manufacturer reckons time lost from the end of the first hour after an accident, another figures it from the beginning of the next day, while in the case of railroads the rules of the Interstate Commerce Commission require that time lost shall not be counted until the third day.

The copper refiner who visited the meeting of the sub-committee on baking reported that his company's practice had been to figure lost time from the moment of an accident, and had been thoroughly discouraged at the relatively poor showing made by his plant under their system of records until the non-uniformity of practice in this form of reporting was made plain to him. After the exchange of views his discouragement was much less evident. It may safely be predicted that one result of the small group meetings will be a more nearly standardized system of records.

PERSONALS

W. A. Miskimen, secretary, and for many years general manager, of the Illinois Canning Company, Hoopeston, Ill., has been elected vice-president of that company to succeed the late Richard R. Zook. Mr. Miskimen is succeeded by Sidney B. Cutright.

S. G. Gorsline, for the past nine years district sales manager of Anderson-Barngrover Manufacturing Company, announces that he is joining the staff of the Research Laboratory of the American Can Company, Maywood, Ill.

Frank C. Gephart, Ph.D., has been retained as a consultant by the Clicquot Club Company, Willis, Mass., manufacturers of ginger ale and other carbonated drinks.

Lee Dingee, who resigned as president and general manager of The Fame Canning Company upon its purchase by Stokely Brothers Company, is now sales manager of Columbus Canning Company, Columbus, Wis.

F. H. Millard, of Chicago, has been elected vice-president and J. J. LeClare appointed general sales manager of the Diamond Crystal Salt Company, St. Clair, Mich.

Mr. Millard has been associated with Diamond Crystal for thirty-two years in sales and executive capacities, having been a member of the board of directors for the last fifteen years. He has taken an active part in the activities of the American Specialty Manufacturers Association for a number of years and at present is a member of their board of directors.

Mr. LeClare joined the Diamond Crystal Company twenty years ago. For several years prior to his present appointment he was manager of the New York branch, where he made an enviable record, at the same time developing a wide acquaintanceship among members of the food industry.

The executive personnel of the Diamond Crystal Salt Company includes: F. W. Moore, president; F. H. Millard, vice-president; Robert M. Farr, secretary and treasurer; J. J. LeClare, general sales manager; directors: the executive officers and J. J. Gannon.

OBITUARY

John A. Lee of Lee, Kaufman and Gale, food brokers, died October 10 at the Presbyterian Hospital, Chicago, after a very short illness, at the age of 77 years. Although never a canner, he spent over half a century in the promotion of canned foods and in his later days when his activities in this respect were greatest he seemed to be giving his whole effort for the sheer joy he experienced in spreading the gospel of canned foods. His Canned Foods Lecture Bureau was his last achievement.

His versatility was unusual, for although an ordained Christian minister, he held the position of police commissioner of St. Louis for three terms and later became Lieutenant-Governor of Missouri and was an important political figure of that state. He was canned goods buyer for several large wholesale houses after he retired from politics and ultimately became associated with the brokerage business.

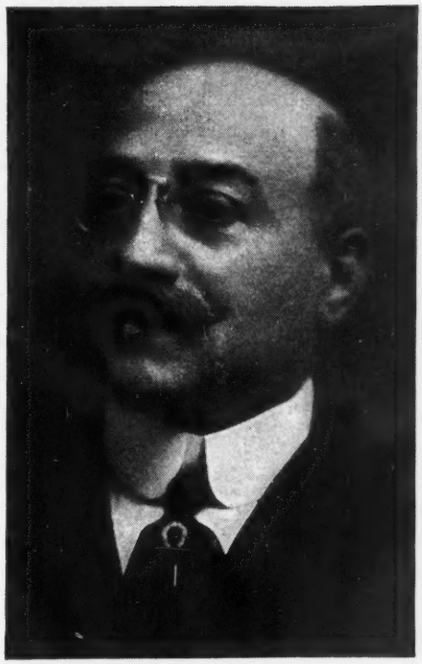
For over twenty years he wrote market letters covering the Chicago canned foods market under the name of Wrangler. In his earlier days at St. Louis he was publisher and editor of the "Interstate Grocer." About three years ago he published his own book

"How to Buy and Sell Canned Foods." At the time of his death he was Secretary-Treasurer of the Western Canners Association, a position he had held for the past 10 years.

W. D. McABEE, director of the Commercial Laboratories of Indianapolis, died early in September at his home in that city. His illness was caused by an accident in his laboratory in the summer of 1924 when he inhaled a trifling amount of a very poisonous gas, arsine. Although at that time his immediate demise was predicted he gave evidence of ultimate recovery, and after the first year of illness was able to be up although unable to administer his business actively. His laboratory functioned for many years as a control laboratory for a large number of canning factories in Indiana during the early years of the war and he was engaged in manufacture of foods.

LOUIS RUNKEL, president of Runkel Brothers, died at the age of 77, after six decades in the chocolate-making business.

Mr. Runkel expired at his home in New York City on the 6th of October. Although up to the past six months he had not been confined to his home, his health had been declining steadily since 1925, and he had gradually found it necessary to relinquish his more active duties.



Louis Runkel

Sixty-two years ago he came to New York at the age of sixteen and two years later the foundation of the Runkel chocolate business was laid. The firm was called H. Runkel & Company and comprised: Hermann Runkel, for whom the organization was named; Louis Runkel; and Adhemar Fieux, who later married their sister.

In 1870 the original home of the company was at Clifton, Staten Island, in a small frame building. The name was changed to Runkel Brothers in 1879 and in 1885 the first factory was built at their present location in New York on West 30th Street.

The present corporation was formed in 1905, including Louis Runkel and his three nephews: Maurice, Ernest D., and Sigismund L. Fieux—all sons of Adhemar Fieux, one of the three founders.

In addition to the development of the Runkel business, its founder did much for the expansion and general betterment of the chocolate industry. He was the organizer and first president of the Cocoa and Chocolate Manufacturers Association of the U.S.A., in addition to having occupied executive offices of major importance in other influential trade associations and business organizations.

Mr. Runkel is survived by his wife; by a brother, Albert, associated with the business; and by his two nephews, Maurice and Ernest D. Fieux, his partners and participators in the building of the organization, who will continue to carry it.

· NEW · CONSTRUCTION ·

Factory and Equipment Requirements

Bakery—J. Brown, 2833 Broadway, Dormont, Pittsburgh, Pa., will build a 2 story, 100 x 120 ft. bakery on West Liberty Ave. Estimated cost $50,000. Private plans. Work will be done by separate contracts. Fishels Bakery, 5th Ave., Pittsburgh, Pa., lessee.

Bakery—Chicago Pie Co., 328 Paulina St., Chicago, Ill., awarded general contract for a 1 story, 120 x 130 ft. bakery at 2430 Congress St., Estimated cost $40,000.

Bakery—Craig's Bakery, W. Craig, Pres., Columbus, Ga., will soon award contract for a 2 story, 88 x 155 ft. bakery. E. O. Smith, Georgia Home Bldg., Columbus, Ga., is architect.

Bakery—Dabross Building Corp., A. Mostoff, Pres., 277 Broadway, New York, N. Y., will build a bakery at 172nd St. and Roesdale Ave. Estimated cost $40,000. Franklin, Bates & Heindsmann, 2526 Webster Ave., New York, N. Y., are architects. Work will be done by separate contracts.

Bakery—Fraser Baking Co., 50 Cherry St., Burlington, Vt., awarded contract for the construction of a 1 story, 95 x 145 ft. bakery to V. A. Bergeren, 78 North Prospect St., Burlington, Vt. Estimated cost $40,000.

Bakery—General Baking Co., 420 Lexington Ave., New York, N. Y., awarded contract for the construction of a 1, 2 and 3 story, 235 x 300 ft. bakery at 24th and 25th Sts. and Gazelle Ave., Norfolk, Va. to R. R. Richardson & Co., National Bank of Commerce Bldg., Norfolk, Va. Estimated cost $200,000.

Bakery—Goldsam Realty Corp., S. Silverman, Pres., 135 Broadway, New York, N. Y., will soon award contract for the construction of a 1 story bakery at Sedgwick and Van Cortland Aves. Estimated cost $60,000. Franklin, Bates & Heindsmann, 2526 Webster Ave., New York, N. Y., are architects.

Bakery—C. J. Patterson Corp., 4050 Penn St., Kansas City, Mo., awarded contract for a 1 story, 96 x 130 ft. bakery at 828 St. Louis Ave., Springfield, Mo., to Fogel Construction Co., 619 Reliance Bldg., Kansas City, Mo. Estimated cost $50,000.

Bakery—Rye-Krax Corp., 530 North Orlando St., Los Angeles, Calif., awarded contract for 2 story, 50 x 110 ft. bakery to Mortenson & Engstrom, 1560 North Western Ave., Los Angeles, Calif. Estimated cost $15,000.

Contracts Awarded for New Plants in the Food Industries

Third Quarter

	1928		1927	
	No.	Value	No.	Value
Bakeries	12	$1,905,000	18	$3,246,000
Packing	11	1,827,000	4	440,000
Dairies	5	570,000	2	379,000
Ice	5	335,000	4	205,000
Confectionery	3	365,000	3	810,000
Bottling	4	1,390,000	3	140,000
Creameries	3	180,000	7	536,000
Fruit canneries	2	90,000	1	50,000
Chocolate	1	200,000	1	152,000
Cereals	2	375,000	1	500,000
Produce term'l	1	3,000,000	1	1,500,000
Flour	1	225,000	..	.....
Milk condenseries	3	550,000	..	.....
Pickles	1	75,000	..	.....
Peanut butter	1	45,000	..	.....
Corn products	1	150,000	..	.....
Groceries	..	.....	1	65,000
Cider	..	.....	1	40,000
Macaroni	..	.....	1	40,000
Grape products	..	.....	1	80,000
Ice cream	..	.....	1	300,000
Milling, feed	..	.....	1	240,000
Total	56	$11,282,000	51	$8,723,000

Bakery—Slade Construction Corp., 881 Ocean Parkway, Brooklyn, N. Y., will build a 1 story bakery at 43rd Ave. and 44th St., Sunnyside, L. I. Estimated cost $50,000. Farber & Kalpin, 1746 Pitkin Ave., Brooklyn, N. Y., are architects. Work will be done by separate contracts.

Bakery—Vietmeyer Bros., 175 Sherman Ave., Jersey City, N. J., will soon award contract for a 2 story addition to bakery on Sherman Ave. Estimated cost $50,000. W. Neuman, 40 Journal Sq., Jersey City, N. J. is architect.

Bakery, etc.—Dept. of Mental Hygiene, Albany, N. Y., received lowest bids for the construction of a bakery, etc., at Brooklyn State Hospital (Creedmoor Div.), Brooklyn, N. Y., from Young & French, 103 Park Ave., New York, N. Y. $115,982.

Bakery Addition — Pioneer Baking Co., 120 Getty Ave., Paterson, N. J., awarded contract for a 3 story addition to bakery, to C. Sikkelee, 972 East 22nd St., Paterson, N. J. Estimated cost $150,000.

Bakery and Grocery Products Factory—The Schust Co., 401 Congress St., Saginaw, Mich., awarded contract for a 5 story, 52 x 130 ft., factory and warehouse for bakery and grocery products on Congress St. to Sorenson & Grosse, 708 Genessee Bank Bldg., Flint, Mich. Estimated cost $150,000.

Biscuit Factory—Standard Biscuit Co., E. B. Bushnell, Pres., 401 Southwest 8th St., Des Moines, Ia., awarded contract for a 2 story addition to biscuit factory at 8th and Tuttle Sts. to Sugarman Construction Co., 725 Tuttle St., Des Moines. Estimated cost $45,000.

Bottling Plant — Coca Cola Co., Macon, Ga., will soon award contract for the construction of a 2 story, 44 x 100 ft. addition to plant. Pringle & Smith, 1012 Norris Bldg., Atlanta, are architects.

Bottling Plant—Empire Bottling Co., 33 Suffolk St., Malden, Mass., is having plans prepared for a 2 story addition to bottling plant on Suffolk St. Estimated cost $40,000. C. F. Springall, Spring St., Malden, Mass., is architect.

Bottling Plant — Houston Coca Cola Bottling Co., 1210 Washington St., Houston, Tex., plans the construction of a 2 story, 107 x 120 ft. bottling plant on Capitol St. Estimated cost $80,000. Prindle & Smith, Morris Bldg., Atlanta, Ga., are architects.

Bakery Addition—Purity Bakeries Corp., M. Carpenter, Mgr., 711 South 10th St., Newark, N. J., will soon receive bids for the construction of a 3 story addition to bakery. Estimated cost $40,000. R. H. Brown, 844 Rush St., Chicago, Ill., is architect and engineer.

Beverage Plant—Flint Beverage Co., E. C. Baily, Mgr., 1521 St. John's St., Flint, Mich., awarded contract for a 2 story beverage plant. Estimated cost $30,000. G. Bachman, 218 Pergelly Bldg., Flint, Mich., is architect.

Candy Factory—J. P. Bruecker and C. Tharinger, 774 3rd St., Milwaukee, Wis., Archts., will soon receive bids for a 5 story candy factory at 287 Pittsburgh Ave. for Sperry Candy Co., 140 Reed St., Milwaukee, Wis. Estimated cost $90,000.

Canning Plant—Cochran Canning Co., San Juan, Tex., will build a citrus and vegetable canning plant, 1 story. Estimated cost $35,000. Private plans.

Canning Plant—Tampa Union Terminal Co., Tampa, Fla., plans the construction of a 2 story, 100 x 120 ft. grapefruit canning and fruit preserve plant, in connection with cold storage plant. Estimated cost $100,000. F. L. Judd is engineer.

Canning Plant — Portage Co-Operative Food Products Co., Portage, Wis., will soon receive bids for the construction of a 2 story canning plant. Estimated cost $100,000. H. V. Tennant, Portage, Wis., is engineer.

Chocolate Factory—Walter Baker & Co. Inc., Adams St., Milton, Mass., will build a 3 story factory. Estimated cost $40,000. Private plans. Work will be done by separate contracts.

Chopping Mills—E. H. Harris, Birr, Ont., plans to rebuild chopping mill destroyed by fire. Loss $25,000.

Citrus Plant—Kampner Interests, U. S. National Bank Bldg., Galveston, Tex., have acquired 1,100 acres of land near Los Fresnos and plans improvements for citrus project. Estimated cost $50,000. Private plans.

Cold Storage Plant—Cudahy Packing Co., A. F. Mills, Supt., Sioux City, Ia., will soon award contract for a 4 story, 54 x 146 ft. cold storage plant. Estimated cost $200,000. Private plans.

Cold Storage Plant—Pere Marquette R.R., Fort St., Detroit, Mich., awarded contract for a 4 story, 60 x 160 ft. cold storage plant at Grand Rapids, Mich. to Owen-Ames-Kimball, 38 Pearl St., Grand Rapids. Estimated cost $250,000.

Cold Storage Plant—State Dept. of Public Welfare, J. E. Harper, Dir., Columbus, O., is having plans prepared for a 2 story, 95 x 150 ft. cold storage plant, etc. on Turney Rd. Estimated cost $150,000. H. B. Briggs, Hartman Hotel Bldg., Cleveland, O., is state engineer.

Cold Storage Plant—Victoria Cold Storage & Terminal Warehouse Co., c/o Foot & Wanger, Bank of Nova Scotia Bldg., Victoria, B. C., will soon award contract for the construction of a cold storage plant. Total estimated cost including machinery $550,00. Ophuls & Hill, 112 West 42nd St., New York, N. Y., are engineers. A. D. Swan & Co., 416 Lancaster Pl., Montreal, Que., are consulting engineers.

Cold Storage Plant and Icehouse—S. T. Cahoon, Woods Hole, Mass., had plans prepared for a 1 and 2 story cold storage plant and icehouse on Sippewissett Rd., Falmouth, Mass. Estimated cost $40,000. W. A. Gifford, Falmouth, Mass., is engineer.

Cold Storage Warehouse — Groves Cold Storage Co., A. B. Groves, Pres., 2609 Walnut St., Kansas City, Mo., is having plans prepared for a cold storage warehouse at 48th St. and Virginia Ave. J. C. Sunderland, 506 Interstate Bldg., Kansas City, Mo., is architect.

Commission House etc.—E. H. Wiener Co., Hill and Forge Sts., Akron, O., (commission merchants) is having plans prepared for the construction of a 3 story, 130 x 130 ft. commission house including refrigeration plant. Estimated cost $300,000. Wilbur Watson & Associates, 4614 Prospect Ave., Cleveland, O., are architects.

Concentration Plant — Armour Packing Co., 208 South La Salle St., Chicago, Ill., plans the construction of a concentration plant at Norfolk, Neb. Estimated cost $30,000. Private plans.

Confectionery Supply Factory — Fargo Food Products Co., P. J. Martin, Secy., 301 Front St., Fargo, N. D., awarded contract for a 3 story, 50 x 100 ft. factory for the manufacture of bakery, hotel and confectionery supplies at 8th St. and 5th Ave. N. to T. F. Powers & Co., 419 8th St. N., Fargo, N. D. Estimated cost $60,000.

Cotton Seed Oil Mill—Farmers Gin Co., Georgetown, Tex., c/o M. M. Harding, plans the construction of a cotton seed oil mill, electrically equipped at Wharton, Tex. Estimated cost $70,000.

Creamery—Louisiana State University, Baton Rouge, La., is having plans prepared for the construction of a 2 story creamery to include all modern machinery at Baton Rouge, La. Estimated cost $40,000. Wogan & Bernard, Canal Bank Bldg., New Orleans, La., are architects.

Creamery Plant—Wisconsin Creameries, Milwaukee, Wis., will soon award contract for the construction of a 3 story, 105 x 152 ft. distribution plant on 8th Ave. Estimated cost $100,000. M. Tullgren & Sons Co., 9 Waverly Pl., Milwaukee, Wis., are architects.

Creamery Plant Equipment—C. P. Bliss, Slate River, Ont., prices on complete equipment for propose creamery on Bay St., Port Arthur, Ont. Estimate cost $60,000.

Creamery and Milk Pasteurizing Plant—Quality Milk Co., c/o C. Ward, 201 North 10th St., Fort Smith, Ark., is having preliminary plans prepared for a 2 story, 140 x 150 ft., creamery and pasteurizing plant. Estimated cost $60,000. Cable Engineering Co., Dallas, Tex., is engineer.

Dairy Products Factory — Silverwoods Ltd, A. E. Silverwood, Mgr., London, Ont., is having plans prepared for a 2 story, 98 x 100 ft. dairy products plant including refrigeration system, etc. at 277 Walland St., St. Catharines, Ont. Estimated cost $75,000. F. F. Saunders, 116 Concord Ave., Toronto, Ont., is architect.

Flour Mill—Okeene Mill & Elevator Co., Okeene, Okla., is having preliminary plans prepared for the construction of an addition to flour mill, 500 bbl. capacity. Estimated cost $40,000. Private plans. Flour milling machinery will be required.

Flour Warehouse—Jesse C. Stewart Co., 568 South Aiken Ave., Pittsburgh, Pa., awarded contract for a 4 story flour warehouse on West Carson St., to C. H. Smith, Murdoch St., Pittsburgh, Pa. Estimated cost $45,000.

Fruit Auction Building — Fruit Auction Co. awarded contract for a 1 and 2 story, 100 x 200 ft. factory at Central Manufacturing Dist., to William P. Neil Co., 4814 Loma Vista St., Los Angeles, Calif. Estimated cost $45,000.

Freezer and Cold Storage Plant Addition —Cudahy Packing Co., 1321 Jones St., Omaha, Neb., is having plans prepared for the construction of a freezer and cold storage plant addition at Kansas City, Kan. Estimated cost $125,000. Private plans.

Freight Produce Building—Pennsylvania R.R., Broad St. Station, Philadelphia, Pa., awarded contract for the construction of a 1 and 2 story, 100 x 119 ft. freight produce building at Pittsburgh, Pa., to W. F. Trimble & Sons, 1719 Pennsylvania Ave., Pittsburgh, Pa. Estimated cost $500,000. T. J. Skillman is chief engineer.

Grain Storage Elevator—Watt Rogalsky Elevator Co., McPherson, Kan., is having plans prepared for the construction of a 150,000 bu. grain storage elevator. Estimated cost $40,000. Homer & Wyatt, 468 Bd. of Trade Bldg., Kansas City, Mo., are architects and engineers.

Grocery Plant—John Sexton & Co., Illinois and Orleans Sts., Chicago, Ill., awarded contract for the substructure of a 6 story, 100 x 125 ft. grocery plant at Illinois and Orleans Sts. to Avery Brundage Co., 104 South Dearborn St. Estimated total cost $350,000.

Grocery Warehouse — Lehigh Wholesale Grocery Co., W. Miller, Mgr., Race and Chestnut Sts., Allentown, Pa., awarded contract for a 1 story warehouse on North Plymouth St., to Butz & Clader, 519 Hamilton St., Allentown, Pa. Estimated cost $75,000.

Ice Manufacturing Plant—American Ice Co., 121 North Broad St., Philadelphia, Pa., subsidiary of Knickerbocker Ice Co., 41 East 42nd St., New York, N. Y., awarded contract for the construction of a 1 story ice manufacturing plant at Somerdale and Comly Sts., Philadelphia, Pa. to Sutton & Stephenson, 1317 Washington Ave., Philadelphia. Estimated cost $40,000.

Ice Plant—C. H. Allbert, Tulsa, Okla., is having preliminary plans prepared for the construction of a 75 ton raw water ice plant. Private plans.

Ice Plant—T. V. Lawson, 236 Cumberland St., San Antonio, Tex., awarded contract for the construction of a 40 ton ice plant, electrically operated at Temple, Tex., to Love Construction Co., Temple, Tex. Estimated cost $40,000.

Ice Plant—Knickerbocker Ice Co., C. E. Small, Pres., 41 East 42nd St., New York, N. Y., awarded contract for a 1 story ice plant at E. S. 233rd St. at Bayside, N. Y., to Wischerth Sons, 8 Essex St., Brooklyn, N. Y. Estimated cost $40,000.

Ice Plant—Porum Ice Co., Porum, Okla., is having preliminary plans prepared for the construction of a 10 ton raw water ice plant and storage room. Estimated cost $25,000.

Ice and Cold Storage Warehouse—Southern United Ice Co., L. Haskins, Local Mgr., Jackson, Miss., plans the construction of a 100 x 180 ft. ice and cold storage warehouse. Estimated cost $245,000. G. E. T. Wells, 100 West Monroe St., Chicago, Ill., are engineers.

Meat Storehouse—First National Stores, 5 Middlesex St., Somerville, Mass., is having preliminary plans prepared for the construction of a meat storehouse on Mystic Ave. Estimated cost $1,500,000. Monks & Johnson, 99 Chauncey St., Boston, Mass., are engineers.

Milk Condensary—City Dairy Co., W. J. Northgrave, mgr., Spadina Crescent, Toronto, Ont., awarded contract for a 2 and 3 story, 50 x 130 ft. milk condensary at Princeton, Ont., to James Vance, 15 Market Sq., Woodstock, Ont. Estimate cost $100,000. Milk handling equipment will be installed.

Milk Condensary—Libby-McNeil & Libby, Merchants Exchange Bldg., San Francisco, Calif., plans the construction of a milk condensary and powdered milk plant at Tracy, Calif. Estimated cost $40,000. Private plans.

Milk Distribution Plant—Alderney Dairy Co., 26 Bridge St., Newark, N. J., awarded contract for the construction of a 1 story, 65 x 70 ft. milk distribution plant on Drummond Ave., Asbury Park, N. J. to J. Sutherland, 133 South 15th St., Newark, N. J. Estimated cost $40,000.

Mill and Warehouse—Peoria Milling Co., C. W. Etheridge, Pres., 1001 South Washington St., Peoria, Ill., awarded contract for a 5 story mill and warehouse, to C. H. Tapping, Jefferson Bldg., Peoria, Ill. Estimated cost $60,000.

Packing House Addition—Cudahy Bros., Cudahy, Wis., will receive bids about Nov. 1, for a 2 or 3 story packing house addition to consist of beef building and tank house. Estimated cost $125,000. Henschen & McLaren, 1637 Prairie Ave., Chicago, Ill., are architects.

Packing Plant—Armour Packing Co., 120 Broadway, New York, N. Y., plans the construction of a packing plant including hog killing and preparing plant, cold storage warehouse, etc. on 17th St., Jersey City, N. J. Estimated cost $1,000,000. Private plans.

Packing Plant—Lawler & White, Inc., La Feria, Tex., plans the construction of a 2 story packing plant. Private plans. Machinery and equipment will be required.

Packing Plant—Van Camp Packing Co., F. W. McKee, Pres., 2002 South East St., Mt. Vernon, Ind., plans the construction of a packing plant. Estimated cost $25,000.

Packing Plant Addition—Piru Citrus Packing Co., Piru, Calif., is having plans prepared for a 1 story, 100 x 100 ft. addition to packing plant. W. P. Sherard, 15 South El Molino St., Pasadena, Calif., is architect.

Poultry Dressing and Ice and Cold Storage Plants—Pennington Produce Co., Sulphur Springs, Tex., plans the construction of a poultry dressing and ice and cold storage plants at Paris, Tex. Estimated cost $25,000. Private plans.

Produce and Feeding Plant—Swift & Co., Packers and Exchange Aves., Chicago, Ill., awarded contract for a 4 story, 88 x 109 ft. produce and feeding plant at North Platte, Neb., to R. Collins, 703 Davidson Bldg., Kansas City, Mo. Estimated cost $100,000.

Rice Mill—Capital Rice Milling Co., C. A. Morse, 310 California St., San Francisco, Calif., awarded contract for rebuilding rice mill at West Sacramento, Calif., to E. L. Younger, Woodland, Calif. Estimated cost $200,000.

Refrigeration Plant Addition—Manhattan Refrigerating Co., T. A. Adams, Pres., 521 West St., New York, N. Y., is having plans prepared for the construction of an 8 story addition to refrigeration plant at 533 West St. Estimated cost $100,000. G. Aus, 244 Madison Ave., New York, N. Y., is engineer.

Salt Warehouse — Morton Salt Co., J. Morton, Pres., 208 West Washington St., Chicago, Ill., is having plans prepared for the construction of a warehouse at Elston Ave. and Blackhawk St. Graham, Anderson, Probst & White, 80 East Jackson Blvd., Chicago, Ill., are architects.